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Table of Contents

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ORIGINAL ARTICLES

- AN ANALYSIS OF FOURTEEN CASES OF DIABETES MELLITUS UNSUCCESSFULLY TREATED BY FASTING. By ELLIOTT P. JOSLIN, M.D., Boston; with F. G. BRIGHAM, M.D., and ALBERT A. HORNER, M.D., Boston. (Continued). 571
GUNSHOT WOUNDS OF THE THORAX. By Walter H. Beebe, M.D., Boston. 578
HOW CAN WE DETECT SLIGHT ENLARGEMENT OF THE HEART? By George Cheever Shattock, M.D., Boston. 584

MEDICAL PROGRESS

- RECENT PROGRESS IN PSYCHIATRY. By Henry R. Stedman, M.D., Boston. 591

HARVARD MEDICAL SCHOOL

- MENAL MEETING. 594
CANCER. 595

BOOK REVIEWS

- Laboratory Methods. By E. G. R. Williams, M.D., and E. G. C. Williams, M.D. 597

EDITORIALS

- THE BOSTON CITY HOSPITAL. 598
THE MEDICAL RECORD, A SEMI-CENTENNIAL. 599
THE BOSTON MEDICAL LIBRARY. 599
TWO NEW MEDICAL JOURNALS. 600
MEDICAL NOTES. 600

CORRESPONDENCE

- AN AMERICAN ASSOCIATION OF GENERAL PRACTITIONERS. Edwin A. Somov, M.D. 405
DUODENUM AND APPENDIX. Wm. Peetus Coote, M.D. 405

MISCELLANY

- RESUME OF COMMUNICABLE DISEASES IN MASSACHUSETTS FOR FEBRUARY, 1916. 404
NOTICES, RESIGNATIONS, APPOINTMENTS, RECENT DEATHS. 405

Original Articles.

AN ANALYSIS OF FOURTEEN CASES OF DIABETES MELLITUS UNSUCCESSFULLY TREATED BY FASTING.

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WITH

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AND

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THE writers thoroughly believe in the fasting treatment of diabetes, as outlined by Dr. Frederick M. Allen of the Hospital of the Rockefeller Institute for Medical Research.* Under this treatment our diabetic patients do far better than ever before. It is rare that untoward symptoms develop if the directions originally laid down by Allen are followed exactly. Our only object in publishing this paper is to show why some of the patients so treated have died and to point out the apparent failure. During this period we have employed alkalis in the treatment of acid intoxication less and less, endeavoring to avoid the necessity for the use of alkalis by the prevention of acidosis. Fasting accomplishes this object in a large majority of the cases, but we have found it advantageous, in very severe, long standing and complicated

cases, without otherwise changing habits or diet, to begin treatment by omitting the fat in order to decrease the source of the acid bodies, after two days to omit protein, and simultaneously to halve the carbohydrate daily to 10 grams, and then if sugar has not disappeared from the urine, to fast. So far this plan has proved satisfactory. In fact, since September 22, 1915, no alkali whatsoever has been employed in the treatment of fifty-four successive cases of diabetes at the New England Deaconess Hospital, although acidosis has at one time or another been present in 37. Of this number only four cases showed acidosis on leaving the hospital, as determined by the ferric chloride reaction for diacetic acid. However, we fully realize that this method is not a decisive test for acidosis. During this period no case has died except Case No. 740, who, while conscious, died suddenly five hours after entrance. Yet we stand ready to use alkalis if the methods above described fail to prove efficacious.

The number of cases of diabetes mellitus fasted from May, 1914, to Dec. 1, 1915, has been 125; of these, 14 patients are dead. A considerably larger number of other cases of diabetes has been treated during this interval, and although fasting has not been practised, the principle of the restricted diet has been observed. In fact, it is almost impossible now to see a case of diabetes which has not been influenced by the principle of fasting which Naunyn recognized and used, Guelph empirically employed, and Allen put upon a scientific basis by animal experimentation, and then tried successfully with patients.

* Treatment of Diabetes, BOSTON MEDICAL AND SURGICAL JOURNAL, 1915, Vol. 172, p. 241.

Protracted Fasting in Diabetes, AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1915, Vol. 150, No. 488.

A study of the fourteen fatal cases shows plainly, in the light of later experience, that at least 8 of these deaths might have been avoided or deferred, and no treatment could have saved the patient with cancer. Seven of these cases died because the fasting treatment was not completely carried out. Of the remaining seven cases, death in two was associated with an accompanying infection; one case represented extremely severe diabetes of long duration; in another cardio-renal complications and goitre were present; in a fifth cancer of the bladder; and in the sixth syphilis. The cause of death of the remaining patient probably had nothing whatever to do with diabetes. A summary of the causes is given in the following table:

Group.	Case No.	Causes of Death.	Number of Cases.
I. A....	648, 707, 430		
B....	764		
C....	740	Incomplete treatment	7
D....	868		
E....	865		
II.	855	Intercurrent infections	2
	513		
III.	887	Diabetes of long duration	1
IV.	576		
	869	Independent complications	4
	806		
	848		

GROUP I. INCOMPLETE TREATMENT.

A. The treatment in Cases Nos. 648, 707 and 430 was incomplete at the start because they were not fasted sufficiently to cause the persistent absence of glycosuria. Consequently, being sugar-free for only one or two days, the course of the disease was not markedly influenced.

B. The sudden abandonment of treatment shortly after the expiration of fasting, which was contrary to the advice of the physician in attendance, was responsible for the death of Case 764.

C. Complete lack of supervision after leaving the hospital was responsible for the death of Case 740.

D. The treatment was discontinued by the physician of Case 868, and six weeks later the patient died.

E. The danger of a sudden change to a protein-fat diet in diabetes of short duration was illustrated by a child, Case 865, two years and two months old. He developed signs of coma within twelve hours after his last meal, which was taken four hours before entering the hospital, where he was seen for the first time.

These are the cases in which it appears to us death might have been deferred. They are no reproach to the principles included in the fasting treatment. They correspond to tuberculous patients, who having undergone an open-air cure, with arrest of their disease, later return home to unhygienic surroundings. The death of such tuberculous patients is no stigma upon the open-air treatment.

These cases are reported more in detail in the fine print which follows:

A. Incomplete Treatment at the Beginning.

CASE 648 was the first case to be fasted. The diabetes was of a severe type, showing a minus carbohydrate balance of 25 grams the day after her entrance to the hospital on March 11, 1914. Upon a restricted diet the nitrogen was 6.1 grams, and the ammonia was 4.45 grams (ammonia-nitrogen: nitrogen = 60%). She remained sugar-free during a portion of one day only in May, 1914, was allowed gradually to return to her former diet, and died in coma on June 16, 1914.

CASE 707. Male, born May, 1897. Onset and diagnosis of diabetes in February, 1913. Came under observation March 7, 1914. During a stay of 3 weeks in the hospital, March 7 to 28, 1914, the patient did not become sugar-free, and the carbohydrate balance was minus throughout, except upon three oatmeal days. The ammonia varied between 2.2 grams and 5.4 grams. By special request, he consented to return to the hospital for a period of 6 days in May, 1914. During this time he was upon a low diet and actually fasted one day, but naturally failed to become sugar-free. Dietary restrictions were resented. His extraordinary appetite was disclosed by the 26.9 grams of urinary nitrogen.

Forty-six days after leaving the hospital the second time, during which period he entirely discarded dietary restrictions, he died in coma.

CASE 430. Male. Developed diabetes in June, 1908, at the age of 52 years, and came under observation in July, 1911. In September, 1914, he was placed upon a restricted diet and fasted, but only for one day. He returned to Canada, and died on March 12, 1915, of diabetic coma. The case is mentioned simply to include all cases in which fasting of any description was employed.

B. Abandonment of Treatment Immediately after the Fast.

CASE 764. Male, age 29. Onset at 26. First seen Sept. 9, 1914. Was fasted after leaving our supervision by another physician, who had had an opportunity to observe a few of our other cases which had undergone fasting. He reported that the patient did not follow the dietary restrictions, exercised unusually soon after a seven days' fast, and died in coma Dec. 23, 1914, six days after the conclusion of the fast. The patient was treated in his own home, 7 miles from the physician, and was that physician's first fasting case. While at the hospital in July, 1914, the carbohydrate balance was minus 9 grams, and the ammonia did not go above 2.8 grams, but after a 7 days' fast at home the ammonia was 3.8 grams.

C. Lack of Medical Supervision after Leaving the Hospital.

CASE 740 was reported in detail in the *American Journal of the Medical Sciences* of October, 1915, Vol. 150, page 491. The young man developed diabetes at the age of 20 years and 10 months, in 1914. Nineteen days before entrance to the hospital, the urine showed 5.6 grams of ammonia-nitrogen in 24 hours, and 74 grams of sugar in the urine upon a supposedly low carbohydrate diet. The accompanying chart illustrates the course of the disease in the hospital. Chart, Table I.

TABLE I.—CASE No. 740. MALE. ONSET IN MAY, 1914, AT 20 YEARS AND 10 MONTHS.

Following discharge in June, he resumed work, but gradually lost strength, gave up work, and despite repeated letters, refused to come under observation until October, 1915.

During this period the diet was followed with considerable care, but the patient was probably still on sugar-free. The weight fell 13 pounds. He finally came to the office in a deplorable condition in October. Unfortunately, entrance to the hospital was delayed for five days, during which time we did not see him, until Oct. 13, when he entered at noon and died five hours later, with most of the symptoms of diabetic coma, though conscious up to 5 minutes before death. The examination of the specimen of urine secured during these few hours showed 200 c.c., specific gravity 1018, albumen trace, diacetic acid +++, nitrogen 0.96 g., ammonia 11 g., sugar 3.1%, no plus or blood, numerous large, finely to coarsely granular casts. The alveolar air showed a carbon dioxide tension of 14.5 mm. mercury.

D. Abandonment of Treatment upon Advice of Physician.

Case 868. Male, born September, 1900. Onset of diabetes in April, 1915. Glycosuria discovered May 7, 1915; came under observation May 25, 1915, and was fasted the following two days. At the end of this time the 24^h amount of urine showed neither sugar nor diacetic acid. During the subsequent 17 days of his stay in the hospital, the diet was gradually raised to carbohydrate 39 g., protein 69 g., fat 45 g., calories 1742, or 46 calories per kilogram body weight, without the appearance of either sugar or diacetic acid in his urine. On August 9, 1915, he weighed 15 pounds more than upon discharge from hospital, and his urine contained 0.6% sugar. This disappeared in three days upon institution of a diet with same values as upon discharge from hospital. He was advised to adhere more strictly to the prescribed diet and on each Monday to have it. September 29, 1915, his physician wrote:

"He continued on his diet through the summer, watching the sugar constantly and regulating diet accordingly. As time went on it became more and more difficult to keep the sugar down. In the early part of September there was quite a bit of sugar, even on a diet of 5% carbohydrate (two drops of urine would produce reaction in Haines' solution). One day of fasting 10 days ago failed to remove sugar, and I saw him the next day and he was very weak, had abdominal pains and pulse was 110. I advised adding one slice of bread and one small baked potato daily and 5 and 10% carbohydrates only. Since then he has felt much better—pulse better, some constipation, but no abdominal pain. He feels much stronger but does not go to school. Tip of nose is a little red. The urine is now 1037, acetic acid present and 4% sugar by fermentation test. Passes about 3 quarts in 24 hours.

"His parents asked me to write you. I feel that he is steadily growing worse and should like your advice as to what course to pursue. Probably you will be more hopeful than I, but I cannot feel but that he would go down more rapidly on a more limited diet than he has at present."

The patient died 3 weeks later of diabetic coma. The duration of the diabetes in this patient was months. Ten cases of diabetes have come under our supervision with onset at the age of 15. Of these cases 6 are dead. The average duration of the total cases was 1 year 10 months, and the average

duration of the living cases is, up to Dec. 1, 1915, 4 years and 3 months.

E. Danger of Sudden Change to Protein-Fat Diet.

CASE 865. Age, 3 years and 2 months. Developed diabetes 3 weeks before coming under observation, May 24, 1915. A grandmother has diabetes. The patient was said to have had 6.5% of sugar in early May, and was reported to have 1.2% of sugar on May 23, but the urine voided on the evening of May 24 showed 4.4% of sugar, with a marked reaction for diacetic acid, a slight trace of albumen, and an abundance of granular casts. Prior to admission to the hospital, the patient had been put upon a nearly protein-fat diet, and although his condition appeared fairly satisfactory when first seen at 10 o'clock at night, on May 24, he had clear signs of diabetic coma the following morning. Despite fasting, which began upon entrance, salt solution by rectum and alkali by mouth, he steadily failed, although on the following day the respiration was not as typical of coma as before. Later complete coma ensued, and death in the evening of May 26. The last specimen of urine examined on May 26 showed no sugar and no diacetic acid.

GROUP II. INTERCURRENT INFECTIONS.

Intercurrent infections played an important rôle in the death of two cases. In Case 855 a gangrenous appendix in an elderly fat man was the primary cause, though the ether anesthesia, which was the secondary cause, was of equal significance. The therapeutic lessons to be learned, however, were that morphine should not precede anesthesia in a diabetic of this type, and that little or no ether should be employed. Whether this change would have enabled the patient to recover is problematical. At any rate, the carbohydrate tolerance would have been lowered less, and fasting treatment following the operation might have been successful.

A severe carbuncle of eleven days' duration was the source of infection in Case 513, and he finally died of multiple abscesses and septicemia. The lessons to be learned from the second case of this group are not so simple. We are content to report the facts here. We realize no dietary treatment could have availed against the septicemia. Suffice it to say, however, that, except in one instance, no alkali has been employed by us since this patient's death. We were led to this step partly because of the great variations which it causes in the water balance of the body, by the serious effect large doses have upon the stomach, and by the hope that with a more rational preventive treatment of acid intoxication, its use may be rendered unnecessary. Yet our experience without using it, covers as yet only thirty-seven cases with acidosis. Instead, we have depended upon fasting and the feeding of small quantities of carbohydrate to prevent the appearance of acidosis, or to remove it if it occurred. The detailed records of the two cases follow.

CASE 855. Acute gangrenous appendicitis. An elderly gentleman of 70 years, weighing 220 pounds, was first seen 4 days after an operation for appendicitis, during which, to the great regret of the surgeon and physician in attendance it was necessary to use a large quantity of ether. This was in part due to 1-4 grain of morphine given subcutaneously preliminary to operation, which so reduced the respiratory excursion that nitrous oxide was a failure, and even a large quantity of ether required. The patient had developed an acute appendix while returning from the South April 9. On April 11 the white count was 17,000 and the temperature 100°. On April 12 the sugar in the urine was 11 grams, and that in the diet 18 grams. On April 13, the date of operation, the patient took 14 grams of carbohydrate in the diet, and voided 24 grams of sugar in the urine and 0.7 grams ammonia. He underwent almost complete fasting for the 4 days subsequent to the operation, yet failed to become sugar-free, and general circulatory weakness increased. The wound progressed satisfactorily. Subsequently, he was given whites of eggs and vegetable broths, with the result that the sugar in the urine rose. Later further additions to the diet were made, with the same result, and he finally died, 8 days after the operation, being conscious up to the last minute.

CASE 513. Multiple carbuncles and septicemia. Developed diabetes in October, 1911, at the age of 33, and first came under observation in July, 1912. At that time he became free from acidosis, but not from sugar, while at the hospital. During the next three years he worked hard in a market, living upon a partly restricted diet. He was not seen except during August, 1912, and July, 1913. Upon July 29, 1915, he tottered into the office, with a carbuncle on the neck of 11 days' duration.

During the first two weeks (July 29-August 12) in the hospital, the change in the condition of the patient was favorable, and the surgeon said the carbuncle did as well as with a non-diabetic patient. Deep-seated abscesses then began to appear in various parts of the body, and the patient began to lose weight, and in the last ten days before his death rapidly failed. His condition was most pitiable, complicated as it was with the pains of multiple carbuncles, extreme weakness and septicemia.

Acidosis steadily increased and he finally died, undoubtedly with acid-poisoning, but not in coma, on September 2, 1915. A blood culture made immediately after death showed a pure growth of *staphylococcus aureus*.

The dietary record of the case is shown first in summary and then in detail.

July 29 to Aug. 5.	Fasting, alcohol 32-45 gms. daily.
Aug. 5 to 9.	Protein 18-20 gms., fat 15-27 gms., alcohol 44-0 gms. daily.
Aug. 9 to 11.	Carbohydrate 1 gm., protein 68-66 gms., fat 42-55 gms., alcohol 0 gm. daily.
Aug. 11 to 12.	Fasting.

Aug. 12 to 13.	Carbohydrate 1 gms., protein 66 gms., fat 88 gms. daily.
Aug. 13 to 15.	Fasting.
Aug. 15 to 19.	Carbohydrate 1 gms., protein 73 gms., fat 75-80 gms. daily.
Aug. 19 to 23.	Fasting.
Aug. 23 to 28.	Protein 37-44 gms., fat 49-51 gms., alcohol 23-0 gms. daily.
Aug. 28 to 29.	Fasting.
Aug. 29 to 30.	Protein 12 gms., fat 10 gms.
Aug. 30 to Sept. 2.	Fasting, because he could not retain food.

It will be seen that he was fasted for 6 days, save for 48 grams of alcohol daily, and on the following 4 days took 18 to 50 grams protein and from 15 to 27 grams fat each 24 hours. He was then allowed a slightly greater quantity of protein and fat for 2 days, then again fasted for 2 days, when the urine became free from both sugar and diacetic acid. Following this period, he was fed one day, and then again fasted for two days, when the urine became free from sugar and the acidosis disappeared. Following this period the diet was again increased, but sugar returned, even amounting to 40 grams in 24 hours, although the carbohydrate in the diet was 1 gram, the protein 73 grams, and the fat 98 grams. After 4 days of fasting, the quantity of sugar in the urine fell to 46 grams only. From this time on he was given no carbohydrate and from 37 to 12 grams of protein and 46 grams of fat on 4 successive days; then several more fasting days were employed, yet at no time did he become sugar-free.

Carbon Dioxide. The carbon dioxide tension of the alveolar air was 30 mm. in the morning and 25 mm. during the afternoon of the day of admission, July 29, and gradually rose after the daily administration of 32 to 48 grams sodium bicarbonate in 7 days to 54 mm., and it will be seen that this persisted, even when smaller doses of alkali were given. On August 11 the carbon dioxide tension amounted to 55 mm. mercury, although no sodium bicarbonate was given that day. Later it decreased, coincidently with the development of metastatic abscesses, and despite 80 grams more of sodium bicarbonate, it kept in the neighborhood of 22 mm. mercury.

Diacetic Acid. Diacetic acid was present throughout, except for two days.

Ammonia. The ammonia was 3.7 grams during the first days at the hospital; later decreased to the neighborhood of 1 gram, but during the last few days of life rose, reaching 5 grams in 24 hours, 4 days before death, although 96 grams of sodium bicarbonate were taken during this period.

Nitrogen. The nitrogen remained practically constant, between 9.3 grams and 12.9 grams, during the first 10 days of fasting and a low diet. In the following feeding period, two observations showed that it rose slightly, but the striking feature of the nitrogen excretion was the marked elimination during the last 6 days

of life, when it varied between 31.6 grams and 37.8 grams, although the patient took almost no food. How long the nitrogen had been high, we regret it is impossible to say, but the marked increase in nitrogenous excretion can hardly be explained by the washing out of retained protein, for at this period, although there were no carbohydrates in the diet, the amount of sugar in the urine was considerable, from 76 to 112 g. and it will be seen that the dextrose-nitrogen ratio at this time was approximately 3:1.

Sodium Chloride. During a portion of the period of observation the salt in the urine was determined quantitatively. It will be noted that this was very low,—4.7 grams to 3.3 grams 10 days after entrance to the hospital. During the latter portion of the starvation period, August 24-26, it was about normal,—8.7 grams to 12.3 grams,—but on the following days it rose with remarkable rapidity to 20, 35.8 and 35.6 grams. The striking increase in the excretion of salt came at a period in which the excretion of nitrogen was also great, and would lead one to conclude that the increased excretion of both salt and nitrogen were due to a washing out of the system of loosely stored nitrogen and salt, were it not for the fact that the sugar in the urine rose as well. One cannot logically attribute the increased excretion of sugar to a washing out of body sugar, because the per cent. of sugar in the blood throughout this period remained practically constant, and the diet contained no carbohydrate. It is more logical to conclude that the sugar and nitrogen stand in relation and that the sugar in the urine really comes from body protein, but before accepting this conclusion the remarkable changes in body weight must be considered.

Body Weight. The weight of the patient July 30 was 62.7 kilograms (138 pounds), and on Aug. 9, 65 kilograms (145 pounds), although the total calories ingested by the patient during these 7 days amounted to 2016, or 336 per day. Therefore this gain in weight must have been due to a retention of water. Explanation of this is afforded by the 264 grams of sodium bicarbonate given during these 7 days. Further evidence that sodium bicarbonate was retained in the body is furnished by the coincident gain in the CO_2 tension of the alveolar air. On August 5 the quantity of sodium bicarbonate had been reduced to 24 grams, and during the following 5 days was reduced still more, until on August 10 it was entirely omitted. Yet during this period the weight continued to rise 0.8 kilograms ($1\frac{1}{4}$ pounds). Edema was manifest, but not very marked, even when the weight was greatest. During the following 9 days, Aug. 11-19, no sodium bicarbonate was given, and the weight rose 0.3 kilogram ($\frac{1}{2}$ of a pound) more, but from this period on it steadily fell, and in 11 days, Aug. 19-30, dropped from 67.8 kilograms (149 $\frac{1}{2}$ pounds) to 51.8 kilograms (113 $\frac{1}{2}$ pounds), a

TABLE 2.

Benedict test.—Where there is a Benedict test, the calculations for total sugar in the urine were based on this test rather than the rotation test.

loss of 1.6 kilograms (3.5 pounds) per day. This rapid loss in weight was not detected in the first few days, because the patient was so feeble and in such pain from multiple carbuncles that it was difficult for him to be moved, but on August 30 this remarkable loss was proven. The actual loss may have been greater, for during this period 80, 96 and 96 grams sodium bicarbonate were administered on respective days, and before this alkali was given the weight may have been lower. As a matter of fact, it did rise during the following 48 hours to 52.4 kilograms ($115\frac{1}{4}$ pounds), when 144 grams sodium bicarbonate were taken. The weight of the body immediately after death dropped to 51.8 kilograms (114 pounds).

The striking loss of 1.6 kilograms (3.5 pounds) body weight daily for 11 days, and the coincident increase in sugar and nitrogen excreted, suggest very important changes taking place in the metabolism. They indicate the importance of maintaining reserve fluid in the body in a striking manner. So shrewd a therapist as Hodgson has recognized the advantage of having patients drink large quantities of mildly alkaline water. The therapeutic benefit which his clinical sense showed him to result from this procedure reveals striking confirmation in these figures. Furthermore, they suggest the importance of studying the weight of severe diabetic patients, preceding, during and after coma. We recall no figures which show so rapid a loss of weight in a diabetic patient.

These remarkable changes in weight suggest several lines for investigation: 1. Does the mere retention of fluid in the body lead to the retention of carbohydrate? 2. Does the retention of fluid in the body lead to a better utilization of carbohydrate? 3. Is the reverse of these two propositions true? 4. Might it not be possible by a series of experiments designed to increase the content of water in the body to throw light upon the capacity of the body to store carbohydrate? 5. May not rapid changes in the weight of severe diabetic patients be an early guide to approaching coma?

Quantity of Urine. In general, the quantity of urine excreted by the patient corresponded with the excretion of nitrogen and salt. It did not correspond with the sodium bicarbonate given. It would seem as if the factor which controlled the quantity of urine was the acidosis. When large quantities of sodium bicarbonate were given during the first period of starvation, the quantity of urine was in the neighborhood of 2200 c.c. During the days August 10 to 22, when no sodium bicarbonate was given, the quantity of urine was about the same. During August 23-27, when no sodium bicarbonate was given, but the acidosis was rising, with it rose the volume of the urine. When extreme doses of sodium bicarbonate were given, August 27-30, the volume of urine increased one-half. During the last period, however, when

the acidosis was extreme, the volume of urine was also high, showing the close relation between acidosis and volume of urine.

(To be continued.)

GUNSHOT WOUNDS OF THE THORAX.*

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DURING the term of service of the Harvard Unit at the American Ambulance (Hospital) in Paris, there were 441 admissions, of which 21 were wounds of the chest. We were fortunate enough to have for study among them examples of most of the important classes of thoracic lesions, such injuries as produced death either immediately or after a few hours being, of course, excepted.

The following brief consideration of such conditions as were illustrated by cases occurring during our period of service may be of interest.

Hemoptysis. So far as we could elicit from our patients, hemoptysis occurred in practically all; in some it was very small in amount and lasted only a short time; in others it was present for many days. In none, however, was there sufficient loss of blood to influence the patient's condition. Apparently in a few cases of thoracic injury, produced by a cleanly penetrating rifle bullet, it either did not occur or, what is more probable, was not noted by the patient. Desgouttes and Bressart¹ consider that the amount of hemoptysis is due more to the character of the missile than to any other cause.

Hemothorax. Hemothorax is more often produced by injuries of vessels belonging to the general than to the pulmonary circulation.

The vessels belonging to the general circulation which are particularly dangerous when injured, are the intercostal, the internal mammary arteries and veins, and the azygos veins. Throughout the greater part of their course, these vessels lie on the inner wall of the thorax, directly underneath the parietal pleura, and are surrounded only by a very small amount of connective tissue. The fact that these vessels are not surrounded by muscular tissue—which in itself possesses hemostatic qualities—into which they can retract, is one of the physical factors that militates against a speedy and firm clotting of the blood in the injured vessels. Also the blood shows no greater tendency to clot when it is in contact with the endothelial lining of the pleura than it does when in contact with that of the blood vessels.

In this connection, Toenniessen² has studied the fluid in cases of hemothorax, and found that at first the fluid was dark red, with a cell count essentially similar to that of blood, but with fewer red cells and a higher percentage of

* Read at a meeting of the Boston Surgical Society, on Nov. 1, 1914.

eosinophiles. The fluid showed no tendency to clot in the pleural cavity or on its withdrawal. Gradually, after the vessel had finally stopped bleeding, the fluid became brighter red, with a decrease in the number of red cells, though the white cells remained about the same, or possibly slightly increased. The percentage of eosinophiles gradually increased, running up to as high as 70%. The fluid now, though showing no tendency to clot in the pleural cavity, did clot on withdrawal into an aspirating bottle. During the stage of absorption when the amount of fluid was decreasing, it became distinctly less hemorrhagic and sometimes almost entirely serous. At this stage it again lost its clotting power when it was withdrawn from the pleural cavity. Toenniessen found this clotting phenomenon regularly in all the cases examined, and he adopts the explanation set forth by Penzoldt.⁹

Penzoldt pointed out that at first defibrinated blood was obtained. Later, as pleuritic irritation developed, an increase in leucocytes occurred, with the development of a new blood-clotting substance. If the fluid remained in the pleural cavity long enough, this clot-producing substance would again gradually disappear, synchronous with the disappearance of the pleural irritation. He felt that the eosinophiles developed locally, as they were not present in increased numbers in the circulating blood.

Sauerbruch¹⁰ has found in his studies of the cases in this war that bleeding from the lung tissue or the vessels of the pulmonary circulation does not last long. This is due either to the fact that there is almost immediate death from an injury to the primary pulmonary vessels or to the fact that in injuries of the lung tissue involving vessels of moderate size, the blood readily clots. Unlike the vessels of the general circulation, those of the pulmonary circulation are surrounded by a loose tissue which, on injury, with the production of either a hemothorax or pneumothorax, contracts down upon the bleeding vessel. Furthermore, the lung tissue itself seems to possess a hemostatic action, probably because of the great amount of air contained in it and the peculiar arrangement of the alveoli, which would apparently readily favor the formation of a firm clot. Another point that is greatly in favor of the early clotting of blood about the injured vessel is the low blood pressure existing in the pulmonary system of vessels.

All those who have had experience with thoracic injuries insist that the most important principle in the treatment of hemorrhage is absolute rest, as thereby the blood pressure is lowered, and the most favorable conditions possible for the formation of a blood clot are produced. In this connection a case we had on our service is of particular interest.

LEON HACKERT. Serial No. 1899. Bed 309. Ward 225. Age, 22. Admitted April 4, 1915. Discharged May 30, 1915, good condition.

Diagnosis. Perforating rifle wound, chest.

History. Wounded March 13, while leaving trench at Zillebeke, Belgium. Rifle bullet entered left shoulder posteriorly, which knocked the patient over. He spat up blood immediately, became very weak, but not unconscious. He had worn his cloth for 7 months, though he had changed his linen 8 days previously. Had not had a bath for 3 months. Condition of the trenches was very muddy. Immediate dressing by brancardiers (stretcher-bearers) and carried to the Poste de Secours one and one-half hours later, where he remained for 19 days. He was then sent to Poperinghe, where he stayed 8 days. Bullet was removed from under the skin on the front of the chest without anesthesia. Has had two dressings in the last 20 days. Spat up blood continuously until March 21. No cough; no dyspnea. Difficulty in lifting left arm.

Examination. Poorly developed and poorly nourished, with marked pallor, and breathing rapidly. Small, crusted, nearly healed bullet wound of entrance in left posterior axillary line, one inch below base of acromion. Linear incision 1 cm. long in mid-sternal line at junction of manubrium and gladiolus nearly healed. Entire left chest anterior and posterior showed absence of voice and breath sounds. Well marked Grocco's sign. Heart markedly displaced to the right. Patient unable to abduct left arm more than 45°.

NOTES.

April 5. Hemoglobin 55%—Sahli. W.R.C. Differential count: polymorphonuclears 63%, mononuclears 4%, lymphocytes 26%, transitories 3%, eosinophiles 5%.

April 7. Patient's temperature is running between 102 and 103°. Fairly comfortable excepting for his dyspnea, which is apparently more marked than on entrance.

April 7. Operative Note.—Under local anesthesia a small skin incision was made and a trocar introduced to the 6th space in the anterior axillary line. 1800 c.c. of dark blood removed, which did not clot in the bottle. (Dr. Boothby.)

April 12. Temperature down. Patient very comfortable.

April 15. Wounds in chest and back entirely healed. Heart seems to have swung back almost to normal position. Signs of fluid in chest are still present, almost as marked as before operation. (Dr. Rogers.)

May 10. Patient up and about. Temperature normal. Chest condition much improved. No improvement in the abduction of left arm, due to circumflex paraparesis.

May 20. Temperature perfectly normal. There is still dullness in the left chest, which is probably due to a thickening of the pleura or beginning fluid. Discharged in good condition. (Dr. Rogers.)

From a study of the history of this case, it is evident that during his stay at the hospital at Poperinghe, bleeding had stopped. The exertion involved in the railway journey to Paris, together with the several ambulance transports connected with the evacuation, started up again a slow bleeding, probably in the intercostal vessel injured by the bullet as it entered the chest in the posterior thoracic region. On account of this persistent bleeding, the intrathoracic pressure gradually increased, necessi-

tating aspiration to relieve dyspnea. Sauerbruch⁴ states that late bleeding is very apt to occur from 8 to 14 days after injury. He believes that at least 14 days should elapse before a long transportation can be made with reasonable safety.

Simple hemothorax was found by Toenniessen⁵ to occur in 23 out of 56 cases (41%) sent to the medical service at a base hospital. Rotter⁶ found a clinically demonstrable simple hemothorax in 46 out of 115 cases (40%) of perforating wounds of the thorax treated in a field hospital. Unterberger⁷ reports that he found a large hemothorax in 28 out of 63 cases of chest wound (43%).

Bradford and Elliott⁸ have carefully correlated the data obtained from all chest wounds that passed through Boulogne from November, 1914, to July, 1915. It is a most interesting and instructive report.

Out of 84 bydies with chest wounds on which a post-mortem was performed, they found 69 had an effusion of blood into the pleural cavity; 23 died of complications, such as purulent bronchitis, paraplegia, or abdominal lesions; 46 died simply from the hemothorax, but in 38 of these the effusion was infected, and in only one case could death, which occurred on the third day of the injury, be definitely ascribed to the hemorrhage.

Clinically they grouped their cases into two divisions: Group A, from November to the week of Neuve Chapelle in March, includes even the mildest cases:

- 168 Cases of hemothorax and also 27 cases of injury of the lung without effusion.
- 114 Cases sterile; of these 48 had such large effusions that aspiration was done.
- 28 Infected effusions which survived resection of rib;
- 20 Deaths (infection).

Group B. from March to July, includes only the more severe cases:

- 160 Cases of hemothorax.
- 86 Cases remained sterile; of these 41 were aspirated.
- 53 Cases became infected and survived resection of rib.
- 21 Deaths, in which 16 were infected.
- 1 Death from simple hemothorax.

These statistics indicate that infection, and not hemothorax, is the greater danger. They advise, therefore, a delay of a few days only at the earliest possible resting place; as a rule, after three days, the patient should be taken as quickly as possible to a base hospital, where there are facilities for the diagnosis and operative treatment of an infected effusion.

Hemothorax is obviously a most frequent complication. However, many cases show no fluid in the pleural cavity, or at least not of sufficient amount as to be recognized by the necessarily rapid examination of an active military hos-

pital. It is probable that a hemothorax is less likely to occur if there are strong pleural adhesions holding the lung in apposition to the thoracic wall. It is doubtful if sufficient intrapleural pressure—in the absence of strong adhesions—is ever developed, capable of stopping, or even decreasing, hemorrhage, as a rise of the pressure within the thorax of a very few millimeters of mercury will cause the respiration to become very much embarrassed, and will not be sufficient to influence the bleeding.

Various authors show a considerable discrepancy in their opinion as to the advisability of aspirating a simple hemothorax. This discrepancy seems to be due to the conditions under which they work. If they are in a position carefully and aseptically to aspirate the chest, it seems an advisable procedure, as thereby the disappearance of the fluid is hastened, with probably less likelihood of the formation of dense pleuritic adhesions. However, it is readily conceivable that in many military hospitals absolute certainty of an aseptic aspiration would not be possible. The difference in treatment would seem dependent, therefore, on the ability under given conditions to perform the aspiration with absolute asepsis. If only relative or poor asepsis is obtainable, the operation should be performed only under extreme conditions of intrathoracic pressure, or for diagnostic purposes, when the temperature indicates the possibility that the pleuritic effusion has already become infected. The temperature curve in the presence of a large hemothorax does not necessarily mean an infection, as is illustrated by our own case, because the absorption of the blood, together with the respiratory embarrassment and mental worry can readily cause an irregularly elevated temperature. However, the safe procedure would be to aspirate all cases of irregular temperature, and if pus is found, to do a thoracotomy.

Many writers, among them Sauerbruch,⁴ recommend that in case aspiration be done, only a small amount of fluid (20-30 c.c.) should be removed at each aspiration. They state that this amount is sufficient to relieve the pressure symptoms temporarily, and if they recur, aspiration can be repeated. The reason for this recommendation is the danger that the withdrawal of a large amount of fluid will so lower the intrapleural pressure that hemorrhage will recur. This reasoning is correct if an aspirating bottle is used, in which a negative pressure of considerable amount has been produced by a pump. With such an apparatus, conditions can readily be conceived in which withdrawal of more than a small amount of fluid would produce within the chest a negative pressure equal to that existing in the bottle. For instance, if the lung is bound down by adhesions, or has been in great part destroyed, it may be necessary to leave a large amount of fluid in the chest to take the place of the non-expansile or destroyed lung. In such cases if attempts were made to withdraw a large

amount, then the dangers of a high and unknown negative intrathoracic pressure would be produced. Therefore it is better to use a simple aspirating needle, to which is connected a rubber tube about 30 cm. long, the whole of which is filled with sterile water, and the distal end immersed in a basin of sterile water. This would produce, when the needle is inserted into the pleural cavity, a suction equivalent to the difference in the level between the surface of water in the basin and the level of the needle. This difference in level can readily be varied from zero up to a limit of 30 cm. It would be perfectly safe with an apparatus of this kind to allow as much of the fluid in the pleural cavity to flow out as would do so of its own accord. If very thick pus is present, a greater negative pressure may sometimes be necessary to insure its passage through the needle. For diagnostic purposes, then, a small hypodermic syringe, as recommended by Murphy,¹ with a sufficiently long needle of large bore should be used. Care should be taken, however, not to remove more than one or two cubic centimeters of fluid by the strong suction of the syringe. Simple forms of apparatus of the kind suggested above, are readily available, even in the most poorly supplied field hospital, and are far safer than more expensive and highly complicated forms that are so often used.

Pneumohemothorax. Very frequently a small amount of air can be demonstrated as existing above the level of the fluid. The air in itself does not complicate the condition, unless it remains in communication with a bronchus, in which case the dangers of infection of the pleural cavity are increased. The air usually disappears very rapidly if there is no permanent communication with the bronchus.

Tension Pneumothorax. A condition called by the Germans "Spannungspneumothorax," can occur from a valve-like formation of either the entrance or exit wound in the thoracic wall, or of a similar formation around one of the larger bronchi. This means that during inspiration more air enters the pleural cavity than leaves it during expiration. The amount of pressure that develops within the pleural cavity depends on the efficiency of the valve-like action of the flap. Occasionally an extreme degree of dyspnea can be developed, which may even result in death. The clinical picture produced by intrathoracic pressure is very characteristic, and when known, readily appreciated. It, however, can be easily mistaken for pneumonia, as the patient may present many of the symptoms of that disease, such as elevated temperature and rapid respiration. However, instead of having a flushed face, he is more likely to be pale and his air hunger to be greater. Depending on the relative proportion between the blood and the air in the pleural cavity, there will be a varying area of dullness and of tympany. During our service we had one case of extreme tension pneumohemothorax, and we fell into the error

of considering it pneumonia. The patient's history is as follows:

ALAIN DAVALAN. Serial No. 1671. Bed 443. Ward 236. Age 36. Admitted April 28, 1915. Discharged May 5, 1915—dead.

Admitting Diagnosis. Wound in left shoulder caused by *éclat d'obus*. Infected hemothorax! Pneumonia?

History. Wounded April 26, 10.00 a.m., near Ypres. First dressing at Berghe, where an operation was undergone, followed by violent hemorrhage. The fragment from the *éclat d'obus* penetrated four layers of clothing. At the operation no foreign body was found, probably because of the violent hemorrhage, which was stopped by packing.

Examination. Patient in good physical condition, but very weak, groaning on slightest movement. Pain in left shoulder and chest. In left shoulder at the edge of the trapezius is a wound 10 cm. long and 3 cm. wide, packed tight with iodoform gauze. In the operating room gauze was removed after an hour's work, revealing a wound 10 cm. deep, extending into the thorax, and absolutely dry. Dry sterile dressings were applied. Temperature 101.4°, pulse 140, respirations 30-40.

NOTES.

May 1. Right chest normal except for exaggerated breathing. Left chest in front, when patient is lying on back, shows some dullness to third rib, becoming flat in axilla. Heart is pushed to the right; right border is 5 cm. to right of mid-sternum at fourth rib and heart sounds much more distinctly heard at heart line than at left nipple. Breath sounds on left are slightly diminished and bronchial in character, as is the voice. With the patient on right side, region around the heart is much more resonant, showing a shift of dullness, probably fluid. Back is dull from mid-scapula down, with diminished breathing, not so bronchial in quality. No Grocco's sign. (Dr. Rogers.)

May 2. Tympany at apex in front and extending down over cardiac area, also in back down to mid-scapula. The position of the heart could not be made out on account of this tympany. The breath sounds are almost absent over this area as well as absolutely flat. Impression—evidently a pneumohemothorax. (Dr. Rogers.)

May 4. Temperature 98.2°. Pulse 120 and better quality. Respirations 26. In spite of this improvement in temperature and pulse, patient has become more and more uncomfortable because of distention with gas, collecting mostly in the epigastrum, aggravating a shortness of breath. Turpentine stapes, enemas, all kinds, and atropin did not relieve this distention.

May 5. Respiratory difficulty grew worse during the day and patient refused all nourishment. Very restless. Distention somewhat less. It was felt that the wound had penetrated from the shoulder into the pleural cavity and that there was a hemothorax, above which was considerable amount of air in the pleural cavity. When doing the dressing, it was noticed that air now and then seemed to suck into the pleural cavity. For this reason we felt it would be of no value to tap the chest, since atmospheric pressure existed within the thorax. The patient's condition was not strong enough to stand any manipulation. Pulse and circulatory system continued strong up to the end. Great embarrassment due to distention was an added factor. (Dr. Cutler.) Patient discharged dead May 5.

This case is one of great interest, and is most instructive. The patient entered the hospital during a busy morning, and the diagnosis of pneumonia was hurriedly adopted. Bradford and Elliott¹ point out that very frequently a large hemothorax is mistakenly diagnosed as a pneumonia on account of the following combination of symptoms: fever, dyspnea, tubular breathing and decreased mobility of that side of chest; these mimicking physical signs are due to the extreme collapse of the lung. They have never found unequivocal proof of pneumonia occurring on the side of a collapsed lung.

The determining sign is, therefore, the position of the heart; if the heart is materially displaced then the symptoms suggesting pneumonia are really produced by fluid over a collapsed lung.

Later careful examination by Dr. Rogers, the medical consultant, showed the presence of a large hemothorax, over which there was a progressively increasing pneumothorax. Moreover, the surgical resident, when dressing the wound, noted that air was sometimes sucked into the pleural cavity on inspiration. The data in this case, both on the medical and surgical side, are thus clear as to fact, but they were misinterpreted on the ground that if air entered the pleural cavity the intrathoracic pressure could not exceed that of the atmosphere, and therefore would not be more dangerous than an ordinary open pneumothorax. This interpretation of the findings was based on a failure to appreciate the pneumodynamic action of the valve-like opening that existed at the base of the deep wound, through which air entered the cavity during inspiration, but could not flow out during expiration. The prolonged continuance of this process resulted in more and more air accumulating in the pleural cavity, with a corresponding displacement of the mediastinum to the uninjured side, and of the thoracic wall and diaphragm respectively outward and downward. Finally, when no further compensatory displacement was possible, the patient died of inability to contract down the chest sufficiently to reinspire.

A further complicating element in the correct diagnosis of this case lay in the distention of the abdomen. The attention of the staff was directed towards attempts to relieve this abdominal distention. It is more than probable that the distention observed was only in a minor degree the result of a true abdominal collection of gas of reflex origin, but was largely due to the contraction downwards of the diaphragm in a compensatory effort to overcome the tension pneumothorax. Autopsy showed the pleural cavity contained over two liters of blood, and that the lung was in greater part destroyed. The autopsy was not conducted in such a manner as would demonstrate the existence of a tension pneumothorax. There were no abdominal lesions.

Cardiac Injuries. Any injury of the heart must, from the military point of view, be treated by absolute rest, with sufficient morphia to render the patient drowsy. Practically speaking, immediate operation is almost invariably impossible. If recovery occurs from the immediate effects, then, in those cases where the bullet still remains in the pericardium or heart, operative measures can be considered after the patient has reached a completely equipped base hospital. The service that had charge of the University division just before the Harvard Unit came on duty, removed by operation, a bullet that lay free in the pericardial cavity. An empyema occurred as a complication of convalescence from this operation, but the patient made a good recovery and was discharged in excellent condition.

Infection. Practically all cases, in which the opening into the pleura remains patent, become infected.

Bradford and Elliott,¹ on the basis of the careful study of 328 cases of closed hemothorax, estimate that about one-third of such cases become infected. A great deal depends on the character of the missile, the condition of the patient's skin and clothing, and at what point on the line of evacuation the observer is located. Unterberger² had 3 out of 28 cases of hemothorax that developed into empyema and in which thoracotomy was performed; Rotter³ had 2 empyemas develop from 43 cases of hemothorax. Tuffler⁴ states that when infection occurs, it is generally due to the presence of a foreign body, or else in wounds caused by a bursting shell.

Reiche⁵ and Ritter⁶ both cite several cases in which the extrathoracic part of a perforating wound became badly infected without extension of the infection to the pleural cavity. They were surprised to find how quickly the pleural opening would close of itself and prevent infection from the superficial wound later suppurating. They believed, therefore, that the resistance of the pleura to the infection was very great. This view does not seem to me correct, as it is opposed to most clinical and experimental evidence. What their data do show, however, is that the pleural membrane, together with the extrapleural fibrous tissue, is very resistant to the passage of an infection from its extra-pleural to its intra-pleural surface. Obviously, care must be taken not to open the pleura in cases of large septic hematomas that develop extra-pleurally and are not connected with the pleural cavity.

Patients with wound of the chest that have an irregularly elevated temperature, should be aspirated; if pus is found, thoracotomy should be performed. In order that the development of an open chronic empyema be as infrequent as possible, the thoracotomy should be done at the dependent point of the pleural cavity, and should be large enough to admit the hand, so that a thorough exploration can be made and all

foreign bodies removed. Marion¹⁴ was surprised at the ease with which intrapulmonary projectiles could be removed in all but one of twenty-seven cases.

Abdominal Symptoms. It is no uncommon accident in general surgical work to open the abdomen and remove a normal appendix, and the next day find a well-developed pneumonia or infected pleuritic effusion. In fact, it is necessary to be on guard against the referred pseudo-abdominal symptoms caused by an irritative thoracic lesion. The same class of referred symptoms may develop from wounds of the chest. Borchard¹⁵ cites a case of referred pain with abdominal distention and spasm, independent of any injury to the abdomen. Bottner¹⁶ saw 4 cases, of which 2 had entrance and exit wounds in the thorax above the level of the dome of the diaphragm, while in the other 2 there were only wounds of entrance. Therefore in the latter cases the course of the bullet was unknown, and injury of the diaphragm could not be eliminated, and in consequence the differential diagnosis of an abdominal complication was very difficult. One case was operated on and a liver abscess found; the patient, however, died. In the other, no operation was performed, and the abdominal symptoms gradually improved and disappeared in 6 days. The two cases with both an entrance and an exit wound above the dome of the diaphragm showed typical intercostal reflex phenomena of the corresponding muscular segment, together with an area of anesthesia anterior to the wound. He gives the following history of one of these cases:

"Weak, pale young man with sunken eyes. Entrance wound 3 cm. beneath right nipple; exit wound just below angle of scapula near 10th spinous process. Large effusion. Dyspnea. Abdomen markedly distended, fairly rigid and tender, especially in right upper quadrant. Temperature normal. Pulse regular and good quality. No stool and no urine. Patient observed every 10-15 minutes, by which it was noted that the abdominal symptoms varied somewhat from time to time. Next morning spontaneous urination and defecation. Improved during the day, and the abdominal symptoms nearly disappeared during the next night."

The abdominal symptoms in our patient, Alain Davalan, previously cited, were very similar to this case of Bottner's, and were probably, in part at least, due to a similar abdominal reflex. The abdominal distension in his case was emphasized by the compensatory action of the diaphragm in attempting to overcome the valve-like action of the entrance wound into the pleural cavity.

Nerve Lesions. Wounds of the upper part of the thorax in the region of the clavicle are very apt to injure some part of the brachial plexus. Therefore paralytic and sensory disturbances of the arm should be looked for as a matter of routine. Only when the patient reaches a permanent base hospital, with proper facilities,

should the question of nerve freeing or nerve suture be considered.

Injury of the sympathetic system is probably quite common. If it occurs in the upper third of the thoracic ganglionic cord, or involves the inferior cervical ganglion (situated just behind the clavicle), probably the stimulative ocular symptoms would be manifested, such as narrowing of the lid and pupil, together with a retrogression of the bulb. An interesting case of this type, in which a probable diagnosis could be made, occurred in our service.

The phrenic, vagus and recurrent laryngeal nerves are in such close relationship with the big vessels that probably any injury of them would result in nearly immediate death from hemorrhage.

SUMMARY.

1. Intra-thoracic hemorrhage is most likely to cease with the patient at absolute rest; therefore he should be kept in bed (under morphia, if necessary) at the first available station.

2. Symptoms rapidly developing, suggesting pneumonia with marked dyspnea, are probably due to the production of a large hemithorax or a pneumo-hemithorax. Such cases should be aspirated and sufficient fluid withdrawn to relieve the dyspnea. Care should be taken not to produce negative pressure within the thorax by the use of an aspirating bottle. A simple needle with rubber tube 30 cm. long, filled with sterile water, and the open end immersed in a basin of sterile water, will produce as great a suction as it is safe to use. With such an apparatus, as much fluid can be withdrawn as will run out of its own accord.

3. After three days the danger of infection exceeds that of hemorrhage. Therefore, if the patient is not in a place equipped for diagnosing and operating for empyema, he should be evacuated to the nearest hospital so equipped, and kept there for at least two weeks before further evacuation.

4. Whenever the patient presents an irregularly elevated temperature, exploratory aspiration with a small hypodermic syringe, armed with a long needle of large bore, should be performed.

5. Whenever the pleural fluid is found infected, a long thoracotomy opening should be made and free drainage instituted.

6. If the patient is in a dangerous condition, prolonged search for the presence of a foreign body should be deferred. However, all foreign matter should be removed as soon as possible in order to hasten the final closing of the wound.

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HOW CAN WE DETECT SLIGHT EN-LARGEMENT OF THE HEART?

BY GEORGE CHEEVER SHATTUCK, M.D., BOSTON.

If we are to detect slight cardiac enlargement, by which I mean an increase of two or three centimetres in the transverse diameter of the heart, the first essential is an adequate standard of the normal.

It is generally agreed that the x-ray, when rightly used, is the most reliable means of measuring the heart. By its aid Moritz,¹ Dietlen,² Veith,³ Groedel,⁴ and Claytor and Merrill⁵ have prepared tables of normal heart-size.

Moritz's work was soon followed by that of Dietlen, his assistant, who amplified it, and prepared new tables based on a larger number of cases. Veith's tables are for children only, and to discuss them here would be to exceed the scope of this paper. These three men worked with their patients in the horizontal position. Groedel subsequently prepared tables from patients sitting. The figures in all of these tables are based on orthodiagnostic tracings.

The patients of Dietlen and of Groedel were divided into four classes, namely, men, youths, women, and girls; and these classes were subdivided into groups based on stature, the difference between each group and that succeeding it being five centimetres. Dietlen's tables show also the average weight and average age of the patients in each group.

All of the tables have been published in full by Albers-Schönberg;⁶ and Groedel⁷ published the tables of Veith and of Dietlen but omitted the weights and ages from the latter. An average, a minimal, and a maximal figure is shown for every group in all tables.

A considerable number of heart-measurements are figured in the tables of Dietlen. Groedel tabulated only the four which seemed to him of special value, namely, the greatest distances from the median line to the right horizontally, a similar measurement to the left, the sum of

¹ From the Out-Patient and Roentgenological Department of the Massachusetts General Hospital, Boston. Read in part at the meeting of the Academy of Medicine of Northern New Jersey, November 17, 1915.

² Simultaneous publication by courteous permission of the *Journal of the Medical Society of New Jersey*.

these which is the transverse diameter, and the length, measured from the apex to the angle formed by the junction of the curve of the great vessels with that of the right border. These four measurements are designated respectively as "MR," "ML," "T," and "L" (Fig. 1).

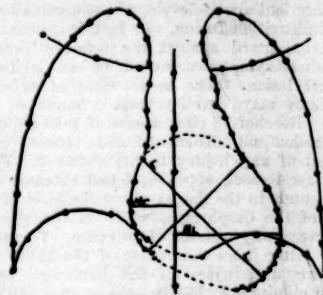


FIG. 1.

Orthodiagram of the heart showing method of measurement.
Dietlen: *Verhandl. d. Congr. f. Inn. Med.*, Vol. II, p. 262, 1904.

"MR" — width to right of median line.
"ML" — width to left of median line.
"T" — length.
— "T" plus "ML".

Groedel's figures are not strictly interchangeable with those of Dietlen as a standard of heart-size because Groedel examined his patients sitting and Dietlen's were horizontal, and it is known that the position of the heart varies with that of the body. Groedel's "MR" in the various classes averages about one centimetre larger, and "ML" about 0.5 centimetre smaller than Dietlen's (Fig. 2). Apparently, in patients

FIG. 2.

AVERAGES FOR GROUPS OF GROEDEL AND DIETLEN.

	MR	ML	T	L	G. D.	G. D.	G. D.	G. D.
Men	4.6	4.3	8.4	8.9	18.0	18.2	14.0	14.2
Youths	4.1	3.9	7.8	8.0	11.9	11.9	12.7	12.6
Women	3.9	3.6	8.0	8.5	11.9	12.1	12.9	13.2
Girls	3.7	3.5	7.2	7.8	10.9	11.3	12.1	12.8
Av. of four groups	4.7	3.8	7.8	8.3	11.9	12.1	12.9	13.2

sitting, the heart lies more to the right than when the patient is in the horizontal position.

Albers-Schönberg⁸ quotes various authors who found that the heart-measurements in standing were smaller than in lying and attributed this to descent of the apex in standing. No careful comparison has been made of the position of the heart between sitting and standing so far as I know. As a rule, however, the differences between sitting and lying are not great, being generally less than one centimetre. Drs. Walter J. Dodd and George W. Holmes, however, have found marked differences in the presence of cerebral palsy.

Claytor and Merrill's figures for the erect position are smaller than those of Dietlen or of Groedel (Fig. 3). The differences for "MR,"

FIG. 2.

CLAYTON AND MERRILL'S TABLE VII: MEN AND WOMEN.

	MR. M.	ML. W.	T. M.	L. W.
Dietlen ...	4.2	3.8	8.9	12.2
Groedel ...	4.6	3.9	8.4	12.0
C. and M. ...	4.0	3.4	8.1	12.1

for "ML" and for "L" are slight, but "T" for both men and women is about one centimetre smaller. The fact that Clayton and Merrill's tables are based upon weight groups instead of stature groups is no reason why the average figures should differ, and the difference seems most easily explained on the ground of the difference of position of their patients and consequently of shape and measurement of the heart, which will be further discussed below.

Comparison of average transverse diameter, or "T" for adult men and women (Fig. 3) shows that men's hearts are one centimetre wider. The length, also, averages one centimetre greater in men.

Differences far greater than these are found when the maximal and minimal measurements of a single height-group are compared with each other. Sometimes the average "MR" or "ML" for men of one height group is larger than that for the first, or even for the second, succeeding height-group as may be seen in Groedel's Table (Fig. 4) which is reproduced below. It shows that the maximal and minimal figures for "MR" in man differ by 2.1 centimetres, and those for

"ML" by 3.0 centimetres, and those for "T" by 3.2 centimetres.

Further comparison shows that the minimal "MR" is in the second group and the maximal in the third. Both maximal and minimal figures for "ML" are in the third group and the same is true of "T." Clearly, then, the maximal and minimal figures for these groups do not increase progressively but very irregularly with the stature of the patient. Still more important is the fact that the *average measurements* in the four groups do not increase progressively. The average "MR" in the first group is the same as that in the fourth; and that in the second, which is smaller, equals that in the third. "ML" shows similar discrepancies, and the average figures for "T" in the four groups for men are almost exactly the same.

It seems, therefore, that the tables of Groedel are valuable for providing maximal, minimal, and average figures of normal heart-size, but that the relation of the figures to stature is not clearly apparent. Groedel's other tables are open to similar criticism, and so are the tables of Dietlen.

Groedel himself criticized the tables on the ground that the material in hand was too small, and he seems to have attributed the discrepancies to this fact.

Dietlen's tables were based on the largest material, comprising 156 men, 31 youths, 58 women, and 17 girls.

It seems to me that Groedel failed to empha-

FIG. 4.

ORTHODIAGRAPHIC MEASUREMENTS. (GROEDEL.)

For Men Sitting

	Height.	MR.	ML.	T.	L.
I.	145-154 cm.				
	Min.	*4.0	*8.0	*12.0	(Min.) *12.0
	Av.	+4.7	+8.4	+13.1	12.9
	Max.	35.2	39.2	+14.4	+14.2
II.	155-164 cm.				
	Min.	(Min.) *3.5	*7.4	*12.1	*13.0
	Av.	+4.5	+8.7	+13.0	13.9
	Max.	35.3	39.5	+14.1	+15.0
III.	165-174 cm.				
	Min.	*2.7	(Min.) *7.2	(Min.) *11.4	(Min.) *12.0
	Av.	+4.5	+8.7	+13.2	14.0
	Max.	(Max.) 35.6	(Max.) 310.2	(Max.) 314.6	(Max.) 315.3
IV.	175-185 cm.				
	Min.	*4.0	*7.3	*12.0	*13.3
	Av.	+4.7	+8.5	+13.2	14.2
	Max.	35.4	39.0	+13.6	+14.7

For Women Sitting.

	Height.	MR.	ML.	T.	L.
I.	145-154 cm.				
	Min.	(Min.) *3.0	(Min.) 6.2	(Min.) 10.1	(Min.) 11.0
	Av.	+3.8	+8.0	+11.8	+13.0
	Max.	34.5	9.8	18.1	18.5
II.	155-164 cm.				
	Min.	*3.2	6.4	10.4	11.5
	Av.	+3.8	+8.0	+11.8	+13.0
	Max.	(Max.) 25.0	9.5	(Max.) 14.8	(Max.) 14.8
III.	165-174 cm.				
	Min.	*3.2	6.5	10.8	12.0
	Av.	+4.0	+8.1	+12.1	+13.2
	Max.	+5.5	(Max.) 9.8	+14.0	+14.5

*†‡ Note that most of the minimal and maximal figures are near the middle of the table. Compare figures with others similarly checked in the same column.

size the main fault of the tables, namely, that they should have been based *not on stature, but on weight.*

That weight is the greatest factor in determining heart-size was clearly shown by Dietlen² (Tables 6, 7, 8, and 9). In Tables 10 and 11 he showed that heart-size has no necessary relation to stature, and this is borne out by the discrepancies in Groedel's table mentioned above. Heart-size seems only to follow stature when the body weight is proportional to stature. (Fig. 5). Dietlen² gives further evidence of the importance of weight in determining heart-size by quoting the anatomical work of Thoma and Muller.[†] It seems strange that men who recognized the preponderant effect of body-weight should have arranged their tables by stature-groups instead of by weight-groups (Fig. 5).

FIG. 5.—FROM DIETLEN'S "TABLE 6."

Body-weight Kg.	No. of Cases	Avg. Stature	Avg. Age.	T.	L.
40-44	7	152	26	11.3	12.1
45-49	5	159	20	11.4	12.9
50-54	27	161	27	12.4	13.5
55-59	39	164	30	12.9	14.0
60-64	54	167	26	13.1	14.1
65-69	24	169	30	13.2	14.5
70-74	18	174	31	13.4	14.8
75-79	5	179	22	14.3	15.5
80-84	5	185	25	14.4	15.3

[‡] Note the progressive and gradual increase of size, the only exception being the last two figures in the second column. The number of cases on which these last figures are based, however, is very small.

Dietlen² raises an objection to weight which may be important, namely, that after the age of forty both weight and height diminish in some cases and that nevertheless the heart continues to increase in size. Fig. 6 indicates this, but the number of cases on which the table is based

[†] Muller: *Massenverhältnisse des Menschlichen Herzens*, 1882.

is too small to allow of safe deductions. If the heart-measurements do really increase after

FIG. 6.

DIETLEN'S TABLE 15.

Age.	No. of Cases	Wt.	Avg. Size.	Mr.	Mr.	T.	L.
15-19	31	54	162	3.9	8.0	11.9	13.6
20-29	33	62	168	4.3	8.6	12.9	14.2
30-39	17	64	169	4.2	8.7	12.9	14.2
40-49	12	61	167	3.9	8.9	12.8	14.1
50-59	13	62	167	4.1	9.1	13.2	14.4
50-69	7	59	167	4.4	9.0	13.4	14.4

Note that with slight differences of weight and of stature there is, on the whole, an increase of heart-size with advance in years, but that it is less pronounced after 40. The number of cases, however, is too small to allow of safe deductions.

forty independently of weight, two factors, either alone may be causative: first, loss of elasticity in the arteries; second, sinking of the right side of the heart, the apex remaining relatively high, so that the heart assumes a more horizontal position. Such a change of position is common in the elderly, and it increases the transverse diameter of the heart without changing its actual size, but there may be hypertrophy also, and, within limits, this may be considered physiological rather than pathological, just as is the gradual increase of blood-pressure which goes with advancing years.

In summarizing the foregoing it may be said (1) that heart-size is dependent first on body-weight, and second, apparently on age, and that stature *per se* is not important; (2) that tables of heart-size based on stature are unsatisfactory.

The tables of Clayton and Merrill, (Fig. 7), are based on weight as they should be. Their table for men is divided into six groups. The first four groups ascend by ten pounds and the last two by twenty pounds. That for women ascends by ten pounds in six groups, and in the seventh by fifteen pounds. The maximum weight

FIG. 7.

CLAYTON, MERRILL: ORTHODIAGRAPHY.

Vertical Heart Orthodiagrams. Male (37 Cases.)

Weight. Pounds.	Cases.	Mr. (Min.)	Mr. (Max.)	T. (Min.)	T. (Max.)	L. (Min.)	L. (Max.)
120-129	3	3.2 3.7 4.3	7.0 7.2 7.5	10.7 10.9 11.3	11.8 12.6 13.5	Min. Av. Max.	
130-139	5	*3.5 3.8 4.2	7.5 8.0 8.5	11.0 11.8 12.5	12.0 13.2 14.0	Min. Av. Max.	
140-149	9	*3.4 4.0 4.6	(Min.) 7.0 7.7 8.4	11.0 11.9 13.1	12.0 13.4 14.5	Min. Av. Max.	
150-159	8	(Min.) *3.2 3.9 4.5	7.8 8.4 9.0	11.5 12.3 13.0	12.5 13.5 15.0	Min. Av. Max.	
160-179	6	3.7 4.0 (Max.) 4.8	8.0 8.2 9.0	12.0 12.4 (Max.) *13.8	14.0 14.6 (Max.) *15.8	Min. Av. Max.	
180-200	6	3.8 4.2 4.5	(Min.) 7.0 8.7 (Max.) 9.7	11.0 12.9 13.4	14.0 14.7 15.8	Min. Av. Max.	

VERTICAL HEART ORTHODIAGRAMS. FEMALE (54 CASES.)						
100-109	2	18.2 18.3 *18.5	16.7 6.8 7.0	19.0 10.2 10.5	12.0 12.1 12.3	Min. Av. Max.
110-119	3	18.0 18.1 *18.2	17.0 17.6 8.0	10.0 10.7 11.1	11.5 11.9 12.4	Min. Av. Max.
120-129	14	(Min.) 12.3 18.5 *4.2	(Min.) 16.4 17.5 8.6	10.2 11.0 *12.2	(Min.) 10.5 12.2 *18.8	Min. Av. Max.
130-139	19	18.0 18.4 *4.0	16.4 7.8 *8.8	(Min.) 9.6 11.2 *12.6	11.2 12.4 *13.3	Min. Av. Max.
140-149	5	12.6 13.5 *4.1	17.0 17.6 *8.8	10.0 11.1 *11.8	12.2 12.7 *13.2	Min. Av. Max.
150-159	7	18.1 3.6 (Max.) *4.8	17.6 18.0 (Max.) *9.8	10.9 11.6 (Max.) *12.8	12.3 12.9 (Max.) *14.2	Min. Av. Max.
160-175	4	3.5 3.8 3.8 *4.1	16.5 17.9 8.5 *9.0	10.6 11.7 12.8 (Max.) *12.8	11.8 12.6 13.0 *13.2	Min. Av. Mean Max.

* † Note the situation of the minimal and maximal figures, and compare figures with others similarly checked in the same column.

for the women is one hundred seventy-five, and for the men, two hundred pounds. Unfortunately, the material of these tables comprises only thirty-seven men and fifty-four women. They show irregularities like those in Groedel's tables but less in degree. Dietlen's weight table (Fig 5) indicates that the irregularities of Claytor and Merrill are to be attributed chiefly to insufficient material. Figures 2, 3, and 4 of Claytor and Merrill's paper show curves indicating the relation of increase of heart-size to body-weight (Fig. 8). For this purpose they used

increase of heart-size in men up to 128 pounds of body weight, and after that the increase is more gradual. In the higher weights the increase is very slight. The increase in women was found to be less marked.

There are still other factors influencing heart-size or heart-measurements which should be mentioned.

Occupation may be important, but its effect probably follows weight in most cases because the well-developed and muscular are heavy, and the sedentary are generally fat, whether they be men or women.

The phase of heart action, according to Groedel,¹ may cause a difference in extreme cases of 0.5 cm. for both borders. He estimates the normal change at about 1.8 cm., but thinks this figure still too high for most cases. It seems, therefore, that the difference of measurement between systole and diastole is negligible as compared with other variations, and yet, to avoid doubt, orthodiagrams should be made in diastole, and it is probably better to use an exposure of not less than one second for teleorontgenography than a shorter period, (if plates sufficiently clear for measurement can be so obtained) in order to show the heart outline in diastole.

Posture, already mentioned, seems to be relatively unimportant in its effect on heart-measurement except when there is marked visceral ptosis. It may be said in general that in standing, the heart apex rotates downward around the base as an axis. "MR" is generally about 1 cm. greater, and "ML" about 0.5 cm. smaller in the sitting than in the horizontal position, and the differences between standing and lying are probably similar.

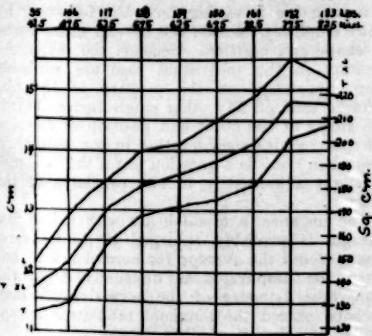


Fig. 8.
Claytor and Merrill's Fig. 4.
(Based on Dietlen's Table 6, see Fig. 5.)

curves of "L" and "T" and of the square area of the orthodiagram. They found that 70% of "T" x "L" gave a close approximation of the square area as obtained by careful measurement. The authors pointed out that there is a rapid in-

The measurement of length, designated "L," is sometimes valuable because it is very little affected by such rotation. As a useful figure for heart-size "L" suffers, however, from the fact that the angle above mentioned may be ill-defined, and that the lowest part of the apex lies below the diaphragm and may be obscured by the shadow of the left lobe of the liver.

The shape of the heart, and consequently its size, is dependent, I believe, to a considerable degree on that of the chest, long narrow hearts being the rule in long narrow chests, and vice versa. The "small heart" in the paralytic thorax has been attributed to tuberculosis, but Westerler¹ pointed out that it was narrow rather than small, and was caused not by tuberculosis but by the narrow chest and low diaphragm.

The position of the diaphragm seems to be the greatest single factor influencing the position of the heart, and therefore, it has an important bearing on shape and measurement. The narrowest hearts are seen with low diaphragm and visceral ptosis, and wide normal hearts with high diaphragm, whether this be due to tight corsets, abdominal distention, or to other causes.

The usual position of the diaphragm in standing, except when temporarily displaced, has a fairly constant relation to the shape of the chest, it being lower in long chests and higher in broad chests. The shape of chest and position of diaphragm generally exert a combined influence on the shape and position of the heart, so that it is difficult to distinguish their efforts separately. Dr. G. W. Holmes recently showed me with the fluoroscope a patient whose heart appeared normal when lying down, but when standing the heart became pear-shaped through ptosis.

The variations of position of the heart between full inspiration and full expiration are important. With expiration the apex is carried upward by the diaphragm and at the same time the right border moves outward a little so that there is a considerable increase in "ML" and a slight increase in "MR." With full inspiration the apex rotates downward and inward and the right border descends causing little change in "MR" but a marked decrease of "ML." During normal breathing the change of position of the heart is slight and the diaphragm moves about equally up and down. When there is marked visceral ptosis, however, the diaphragm remains nearly as low as in full inspiration. On the other hand it ascends much with full expiration, and displaces the heart correspondingly in this phase of respiration.

The relations of the chest-wall, diaphragm, and heart in elderly persons are complex. There is usually more or less visceral ptosis combined with descent of the diaphragm, but there is also sinking of the chest-wall so that the apex generally remains at the level of the fifth interspace. The descent of the diaphragm is more than offset by stretching of the supporting structures at the base of the heart, so that the

right side descends, and instead of a long heart we find a broad heart, the result of rotation. It was mentioned above that the increase of blood-pressure, and arterial changes of old age tend to cause enlargement of the left ventricle, which may be considered physiological when slight, and which tends further to increase "ML."

Three normal types of heart-shape are commonly recognized: (1) the oblique; (2) the relatively perpendicular, and (3) the relatively horizontal. In the first type the heart is ovoid, in the second it is longer and narrower, and in the third it approaches the shape of a boot with heel to right and toe to left. Besides these there is a type associated with visceral ptosis, narrow chest, and low diaphragm. Its location is almost central, and it has been called by the Germans the "drop-shaped heart." It might better be described, I think, as pear-shaped.

The hearts of youths and girls are apt to be relatively oblique, and those of old persons relatively horizontal, or boot-shaped.

Although the heart in young girls is long and like that of young men in relation to the median line, that of grown women is broader, the apex is higher, and a larger proportion of the heart lies to the left of the median line. Dietlen² showed this difference and attributed it to the use of corsets, with resulting higher position of the diaphragm.

Dietlen's article³ on the position of the normal heart is classical and should be read by those who want detailed information. In a subsequent article he presents data on the influence of posture on blood-pressure and on heart-size.⁴ Albers-Schönberg⁵ and Groedel⁶ review Dietlen's work and discuss that of others bearing on the shape, size, and position of the normal heart.

Among the foregoing facts the following require emphasis. First: the normal heart varies in shape and position. Second: the shape and position in the individual case are probably more dependent on the position of the diaphragm than on any other single factor. Third: the shape of the chest and position of the diaphragm require consideration in the individual case when there is a question about the existence of slight abnormality in size or shape of the heart.

For instance, a broad heart with a low diaphragm is probably enlarged if its measurements exceed the average for normal hearts, but when the diaphragm is unusually high, the transverse diameter of the normal heart may perhaps exceed the maximal tabulated normal figure, as a result of displacement.

When using measurements to determine the presence or absence of cardiac enlargement the weight of the patient, his age, and the position of the diaphragm at the time of examination require careful consideration. Increase of "MR" or of "ML" points to enlargement to right or left, but when one is increased and the

other decreased, "T" remaining normal, we may have to deal with displacement rather than enlargement. In such cases "L" is valuable as a check if it can be measured accurately.

There are other measurements which require brief mention. The breadth of the heart at right angles to the length, and its relation to length were advocated as standards by Otten,¹⁴ and the surface area (measured by laying the orthodiagram over a sheet of paper ruled in square centimetres and counting the squares) by several observers who recognized the insufficiency of other methods. Groedel¹⁵ objects to both on the ground that the position of the upper border near the base and of much of the lower border is often doubtful even when the orthodiagram is used. Teleorventenograph would be still less satisfactory in such cases. Consequently, estimates of breadth or of surface area are of uncertain value.

Giegel¹⁶ proposed a method of comparing surface area with body weight by means of what he called the "reduced heart index." This he obtained by a mathematical formula and compared with a standard area per kilogram of body weight. He admitted that the method was open to objection but thought it the best available. His method seems of doubtful value.

When one considers the many factors influencing heart-size, and the inadequacy of existing tables it seems best for the present to compare heart-measurements with average normal figures for the sexes, and whenever the measurements differ much from the averages, to compare them with maximal or minimal standards, to note the position of the diaphragm, to observe the state of nutrition, and to consider the age of the patient if below twenty or above forty before reaching a conclusion. A table of normal standards from Dietlen, Groedel, and Clayton and Merrill is appended (Fig. 9).

Clayton and Merrill's figures for men show

FIG. 9.

STANDARDS OF NORMAL HEART-SIZE IN CENTIMETRES.

Men—Standing.

Author; Age;	No. of Cases;	Mr.	ML	T.	L
Claytor and	Min. 8.0(3.2)	7.0	10.7	11.8	
Merrill;	Avg. 4.0	8.1	12.1	13.7	
42 cases	Max. 4.8	11.0(9.7)	14.0(13.8)	15.8	

Men—Seated.

Groedel	Min. 3.5	7.2	11.2	12.0
	Avg. 4.6	8.4	12.8	14.
	Max. 5.6	10.2	14.6	15.8

Men—Horizontal.

Dietlen; 156	Min. 3.1	7.4	11.0	12.1
cases; age	Avg. 4.8	8.9	12.2	14.2
30 or more	Max. 5.9	11.	15.3	15.9

Women—Standing.

Claytor and	Min. 2.8	6.4	9.6	10.5
Merrill;	Avg. 3.4	7.8	11.1	12.5
54 cases	Max. 4.8	9.3	12.8	14.2

Women—Seated.

Groedel	Min. 3.0	6.2	10.1	11.0
	Avg. 4.6	8.4	11.9	12.9
	Max. 5.0	9.8	14.3	14.8

Women—Horizontal.					
Dietlen:	Min. 2.4	6.8	10.8	11.7	
cases; age	Avg. 3.6	8.5	12.1	13.2	
17 or more	Max. 5.2	10.3	15.7	15.0	
Youths—Seated.					
Groedel	Min. 3.2	7.0	10.5	11.2	
	Avg. 4.1	7.8	11.9	12.7	
	Max. 5.2	8.5	13.5	14.3	
Youths—Horizontal.					
Dietlen:	Min. 3.0	6.5	10.4	11.4	
31 cases;	Avg. 3.9	8.0	11.9	13.6	
ages 15-19	Max. 5.1	9.3	13.8	15.2	
years.					
Girls—Seated.					
Groedel	Min. 2.5	6.5	9.0	10.5	
	Avg. 3.7	7.2	10.9	12.1	
	Max. 5.2	8.7	12.7	14.0	
Girls—Horizontal.					
Dietlen:	Min. 2.5	6.5	10.8	11.9	
17 cases;	Avg. 3.5	7.8	11.8	12.8	
ages 15-17	Max. 4.0	8.8	12.6	14.0	
years.					

variations of 4.0 centimetres within the normal for "ML," Groedel found differences of 3.0 centimetres and Dietlen of 3.6 centimetres. The respective variations for "MR" are 1.8 cm., 2.1 cm., and 2.8 cm.; those for "T" are 3.3 cm., 3.2 cm., and 3.3 cm.; and those for "L" are 4.0 cm., 3.8 cm., and 3.8 cm.

Therefore, it appears that a heart, originally small, might become pathologically enlarged by 3cm. or even more before this enlargement could be detected by measurements alone; but, in such a case, if nutrition, position of diaphragm, and age, when necessary, were considered, it might be possible to discover enlargements of not more than two centimetres. In ordinary cases enlargements of two centimetres in transverse diameter should be demonstrable in this way.

Examination of the tables (Fig. 9) shows that the variations of "MR" and of "ML" are greater than those of "T." This can easily be explained on the ground that the normal position of the heart is not constant but variable, and that sometimes a greater proportion lies to the right or to the left. We know that this is the case when the hearts of men are compared with those of women who wear corsets, and it can scarcely be doubted that other things which influence the position of the diaphragm may influence the location of the heart similarly. We know also that "ML" is considerably diminished at full respiration, and increased at full expiration, and that "MR" is less affected by the phases of respiration than is "ML." "ML" is relatively much smaller in the pear-shaped heart than in other types. Dietlen prepared tables of the varying average relations of "MR" to "ML" for men, women, and young persons. The average relation of "MR" to "ML" in men he found to be 1.0 to 2.1 and the average for women 1.0 to 2.4, but in a group of women between the ages of twenty and twenty-nine, at which age displacement is most frequent, the relations were 1.0 to 2.6.

These facts assume importance when it is necessary to distinguish slight enlargement

from displacement; for instance, in any case in which the figures for "MR" or for "ML" were disproportionately large, and yet "T" was within normal limits. If the disproportion in such a case could not readily be explained by the position of the diaphragm, or attributed to a normal type of heart-shape, there might be enlargement even though "T" were within normal limits.

Before passing from measurement of x-ray material to other means of detecting abnormalities in the heart, let us consider the basis of the statistics of Groedel and of Dietlen.

Dietlen's¹ material was selected with the greatest care. He excluded all persons having cardiac lesions, severe, or chronic pulmonary diseases, acute infections, nephritis, arteriosclerosis, old syphilis, anemia, cachexia, marked scoliosis or kyphosis, and hard drinkers. Nearly all who complained of cardiac symptoms were excluded, even when clinical signs of disease were not found, and also those in whom the fluoroscope showed aneurism, marked sclerosis of the aorta, or an abnormal position of the heart; and, finally, the rate, rhythm and quality of the pulse were noted. In doubtful cases the blood-pressure was taken. The patients were all ambulatory persons suffering from mild gastric or nervous diseases, muscular rheumatism, gonorrhoea, fresh lues, skin diseases, or slight injuries, and a large number of soldiers were included in the series. The patients of Groedel and of Claytor and Merrill doubtless, were selected with equal care.

It seems pretty certain, therefore, that very few patients with pathologically enlarged hearts were included among the tabulated cases, and yet, I think it possible that some such may have been included, and that, consequently, the maximal figures may be a little too high.

X-ray plates and orthodiagrams may be of great value to show the outline of the heart. The value of such outlines for early diagnosis has been urged by Ottlen,¹⁴ Wessler,¹⁵ Claytor and Merrill,¹⁶ and others. The subject deserves much more consideration than it has as yet received. It seems likely that the cardiac outline will often show abnormalities before they can be demonstrated by measurement, and that these changes may be of great value in discovering slight hypertrophies of the right or left ventricle at a stage when there is little or no dilatation and, therefore, little enlargement.

Cardiac enlargement is due mainly to dilatation of the cavities of the heart, and appreciable dilatation is often preceded by hypertrophy with little or no dilatation. We all know how difficult it may be to detect cardiac enlargement in early chronic nephritis and this is because hypertrophy, as such, adds little to the size of the heart. The ventricle may be doubled or trebled in thickness, but, if the cavity be not enlarged, the increase of heart-size is small. In cases of this sort a rounded apex and curved

left side suggests hypertrophy. Wessler,¹⁶ found this sign valuable as an index of the presence of nephritis in children at a stage when the elevation of blood-pressure was slight, and when there was doubt as to the significance of albuminuria.

Finally, fluoroscopic examination of the heart requires consideration. Its advantage lies mainly in the fact that it shows the heart in action, and it is probable that it will be more valued in the future than it has been in the past. Not only can the movements of the heart as a whole be studied in this way, but the pulsation of the different parts can be observed. The method affords also a general view of the heart and surrounding structures, and may suffice in some cases to give the desired information without plates or tracings.

SUMMARY.

Before finishing I want to emphasize the importance of skillful physical examination and careful history as a means of discovering abnormality in the circulatory system and slight signs of enlargement of the heart.

When findings are inconclusive, an examination with the fluoroscope may quickly clear up the diagnosis. In other cases an orthodiagram or a teleoroentgenogram may provide important information by showing slight abnormality in the *outline* or *measurements* of the heart. Even with good technic none of these methods are faultless, and normal heart-size is variable. Therefore, enlargement should be judged, as Groedel¹ said, not by millimetres, but by centimetres.

By using heart-measurements as described above, it should be possible to detect enlargements of two centimetres in transverse diameter of the heart in most cases, but enlargements of three centimetres may occur without exceeding the maximum figures and in such cases abnormality may be difficult to demonstrate.

Abnormal shape may give the earliest evidence of hypertrophy.

The relative merits of orthodiography and of teleoroentgenography, the technic, and the sources of error have been discussed by Albers-Schönberg,¹⁷ Groedel,⁹ Dietlen⁶ and others. Neither method is satisfactory without proper equipment, nor in the hands of one unfamiliar with its difficulties and possible sources of error.

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Medical Progress.**RECENT PROGRESS IN PSYCHIATRY.**

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PART I.**THE CEREBRO-SPINAL FLUID AND LUMBAR PUNCTURE IN DELIRIUM TREMENS.**

Steinbach¹ makes it clear that lumbar puncture is of real value either in cutting short attacks of delirium tremens, or in moderating the severity of the symptoms during the attack. In acute alcoholic poisoning, Schottmüller and Schaum found an increase in pressure in the spinal fluid and detected the presence of alcohol. These findings Steinbach confirms and regards the hypertension as an important factor in the etiology of the delirium since it disappears with the subsidence of the attack. The presence of alcohol in the spinal fluid was found to be dependent on the amount of liquor consumed, just before or during the first few days of the attack, and might otherwise be absent. The albumin content was slightly increased in 3 of the 18 cases on which the article is based. No increase in cells nor Wassermann reaction was found in non-luetic cases.

In all but one of the cases puncture was followed by quick subsidence of the motor unrest and deep sleep without hypnotics. In a number of cases, the patient was lucid on awakening, but in others orientation remained clouded for a short time. In two cases the delirium recurred and a second puncture was required. Serious physical complications do not contraindicate puncture. The increased pressure is attributed to excessive secretion by irritated meninges and defective resorption of the spinal fluid. He does not believe that the alcohol content of the spinal fluid is directly responsible for the delirium. He considers that the irritated meninges and the thickening and connective tissue overgrowth of the pia in chronic alcoholics are the results of the development of "secondary poison" in the body from faulty metabolism.

The good effect of lumbar puncture, therefore, is due not solely to reduction of the pressure, but also to the diminution of the irritant "secondary poison" and the reestablishment of normal equilibrium.

The rational plan of treatment in delirium tremens would, therefore, appear to be lumbar puncture and withdrawal of as much spinal fluid as possible, followed by introduction of a sufficient amount of physiological salt solution to bring the pressure up to normal level.

ALCOHOLIC HALLUCINOSES.

In an exhaustive study of this subject, von Schneider² reaches the following conclusions:

1. Alcohol as an hereditary and etiological factor in the production of insanity has been overrated, incidence being confused with cause.

2. Alcoholic hallucinozes are separate and distinct from the toxic Korsakow and delirium tremens, and show no mental or physical signs of toxic psychoses.

3. The patients who develop hallucinozes are opposite to the homosexual in physical traits, mental characteristics, civil condition, occupation and general reaction to sexual subjects.

4. The alcoholic hallucinozes can not be classed with those of dementia precox because the make-up, the age of onset, the etiology, the suddenness of the onset, the short duration, the complete recovery with unusually good insight and interest and confidence in the future, and the fact that persons developing dementia precox are not addicted to alcohol are directly opposed to this classification.

5. That the alcoholic hallucinozes are purely functional and allied to the manic-depressive insanity and to the recoverable non-alcoholic episodes, hallucinatory and otherwise, in the constitutionally inferior—is indicated by facts gathered from the study of psychiatry of races, of make-up, etiology and outcome. Moreover, the manic-depressive individual is notably given to alcoholic excesses, and manic-depressive attacks and hallucinozes are produced in the same person, and in different persons by exactly the same factors, including alcohol.

6. Alcoholic hallucinosis is a misleading title for the psychosis, because definite precipitating factors other than alcohol are present and necessary in its production and are often reproduced in the psychosis, which shows their importance; because alcohol is not the only factor nor the most important factor nor even a necessary factor in its production, as shown by numerous hallucinozes identical in course and outcome, where alcohol and other toxic factors can be excluded; because debauches both before and after attacks, when the mental precipitating factor is absent, cause no difficulty; because other psychoses, in the same individuals, in which alcohol plays the same part, are not called alcoholic.

INTOXICATION IMPULSE.

Experience during the last four years has forced on Lambert³ the belief that the majority of periodic drinkers, who are endeavoring hopelessly to cease their periodic sprees, are really cases of chronic tobacco poisoning. This is seen more frequently among the incessant cigarette smokers than among those who usually smoke a pipe or cigars. It is seen most commonly among those who always inhale their tobacco smoke. Drugs are absorbed by the tracheal mucous membrane as quickly as by subcutaneous injections. The effect of the pyridin and collidin, and other substances contained in tobacco smoke, is quickly felt by those who inhale. The case with which

cigarettes can be smoked, the universality of the habit, and the accepted permission that a cigarette can be smoked often in cases in which a pipe or a cigar cannot, add to the frequency of the cigarette indulgence. Tobacco is first used to soothe the nerves, and is taken for its soothing effect. In the early stages it slightly quickens the circulation and thus increases cerebral action. It, therefore, helps in mental rapidity in the early stages of moderate indulgence. Soon it is the accepted panacea for any worry or disturbance of the equilibrium of daily life. Then it is soon necessary to have a certain number of cigarettes that a certain amount of the narcotic may be absorbed to smooth out the daily existence. In this stage of tobacco poisoning the lotos eating contentment and mental inertia are evident and further over-indulgence brings on a nervousness which, in the beginning, a very little more indulgence in tobacco will allay. Soon, however, the more tobacco that is smoked and the more that is inhaled, the greater is the nervousness. It has then ceased to produce its narcotic effect and is producing its chronic poisoning. The individual, therefore, turns to something that he knows will have a narcotic effect and quiet his over-wrought nerves. This he knows alcohol will do, and in these individuals the first drink of alcohol leaves them not sober and starts in them its narcotic craving which drives them on to the full expression of their spree. As they sober up they cease for a few days both smoking and drinking, but as soon as they are over the spree they begin to smoke again and the vicious cycle is sooner or later completed. Lambert is firmly convinced that this double narcotic poisoning explains the majority of the periodic drinkers of to-day. If these patients are made to cease their smoking, their drinking ceases automatically. It is the expression of an uncontrollable poisoning.

MENTAL CHANGES ACCOMPANYING VISCERAL DISEASES.

France⁴ elaborates the observations of Head, published in *Brain*, 1901, xxiv, Head found two symptoms referable to the nervous system in cases of cardiac decompensation, viz: reflected pain along the distribution of the fifth nerve, and a mental and emotional abnormality, aside from any worry about the disease, characterized by depression, anxiety and fear, often with a sense of impending ill and, further these emotional states occurred either with or without distinct delusions and hallucinations. France confirms this statement and adds that the emotional state arising from mechanical difficulty resembles closely that arising from a psychosis, and the true cause of the emotional state may remain unexplained, or may be attributed to hallucinations or delusions. He believes that persistent cardiac irregularity will produce in almost every case either slight and transitory emotional disorders or a distinct and permanent psy-

chosis. He also states that the first mental symptoms of cardiac diseases occur during hypnagogic or sleeping states, and that there is much to substantiate the old view that night terrors and nightmares are often caused by cardiac arrhythmia. The consideration of such states is urged on psycho-analysts.

The study of the nervous symptoms will often warn the physician of impending cardiac disturbance before physical signs of the malady can be detected. The possibility of the occurrence of pain during the somnolent state from cardiac arrhythmia from cardiac and myocardial changes preceding the onset of angina pectoris is thought worthy of further study.

Neuralgia of the trigeminal occurs with sufficient frequency to be of diagnostic and prognostic value to the physician. The symptom may develop in any case of heart strain and may be the first and only symptom of its serious increase. In chronic cardiac affections, neuralgic pains should be regarded always as indicative of the beginning of a period of disturbed compensation.

It is important to remember that many cases of trigeminal neuralgia, or of neurasthenia with anxiety, fear and depression, especially in patients during the fifth decade of life, may be caused by cardiac disorder not sufficiently developed to be discoverable from physical signs. The writer thinks that the limitation of motor activity in cases of cardiac disease by pain and depression may be biologic reaction for the protection of the organism.

PELVIC DISEASES AND MENTAL DISORDERS.

Out of 617 admissions, Perkins⁵ analyzes 478 cases of mental disease of whom 310 showed pelvic disease, and 119 complained of it. She thinks that:

1. Pelvic disease, if causally connected with psychoses, can be regarded only as a factor entering into the causal constellation.
2. There is evidence to show that in manic-depressive insanity, pelvic disease is found more often than in dementia precox.
3. Gynecological treatment or operation for the relief of pelvic disorders in our cases have given satisfactory results in benefiting the mental condition in about half of the cases of the manic-depressive group.
4. No benefit to the mental condition has been observed after operations in cases of dementia precox.
5. In epilepsy, in a very limited material of three cases, we have seen one very striking and immediate improvement in the mental state, as well as in the frequency of convulsions. In another case the result was less immediate but also quite satisfactory.
6. Gynecological operations may be one of the precipitating causes of psychoses. The severity of the operation bears no constant relation to the psychosis, and it is possible that

the operation may sometimes act merely as a mental precipitating cause.

7. As to the question of operation in nervous women, not only the physical but also the mental condition should be more thoroughly considered than is often done, and if possible, an adjustment should be brought about before the operation is performed.

8. Sometimes the desire to be operated upon is a symptom of a mental condition.

9. Among twenty-four cases of insane imbeciles studied, fifteen were known to be infected with syphilis or gonorrhea or both. Nineteen had been sexually irregular. Nine had had illegitimate children (one, 3; one, 5). Two, who were married, had had five children.

SENIILE PSYCHOSES.

Bleuler⁴ gives an outline sketch of the various senile psychoses as the last fifteen years have classified them by the organic findings. The association of ideas suffers particularly in the organic forms; in progressive paralysis or actual senile degeneration, the drawbacks of business undertakings are not taken into account, and the man is liable to do extremely foolish things as he sees only the chances of success. On the other hand, the man with temporary melancholia or morbid worry, sees only the chances for failure. With this defect in association of ideas, a man is liable to jump off a bridge after his hat, if it was blown into the water, or jump off a high porch after his cigar if he happens to drop it. This defect in association, and not a perverted moral sense, is the probable explanation of the sexual crimes of the senile. They see in a little girl merely the female, and if it is possible to make clear to them the extent of their crime, they feel normal horror and remorse if they had formerly been men of character.

The instability of the emotions causes the senile to be exceptionally swayed by suggestion. One who knows how to manage suggestion can do as he will with the senile, while under other circumstances, they are extremely obstinate and perverse. The way in which the senile forget recent events and recall those farther back sometimes permits a date of demarcation, showing exactly when the mental trouble began. With organic disease the sleep is usually disturbed; such persons may be able to sleep in the daytime while they are restless and excited at night.

As we do not know the causes, we can not do much in prophylaxis or treatment of senile psychoses. It is wise, however, for the patient to avoid alcohol and tobacco, as there seems to be a connection between tobacco and arteriosclerosis. When the psychosis has developed, the physician should see to it that the patient does not lose his property by foolish business ventures, etc. A carefully written out report at the time of the findings in the case may prove of valuable assistance in combating an unjust will. On the other hand, the physician's testimony after an attack of apoplexy may prove valuable evi-

dence as to the unimpaired mind when the layman thinks that the aphasia, etc., testify to mental confusion.

Physical and psychic treatment of arteriosclerosis psychoses may be of great benefit, especially in the early stages. Measures that make much demand on the patient should be avoided and the patient should be guarded against mental and physical effort beyond what he can stand. Complete repose is inadvisable; we must cautiously ascertain the limits in each case. Tonics for the heart may be useful, supplemented by opiates if there is much dread. Potassium iodid, 5 parts, with potassium bromid, 20 parts, is often of decided benefit. Large intake of fluids, especially alcoholic, should be avoided, but the main point is to influence the patient's mind, comforting and tranquillizing him; the symptoms grow milder and rarer as the patient is brought to pay less attention to them. It is a great blessing if he can work and thus be diverted. Work, therefore, should never be forbidden, but the right kind and amount of work should be found for each case. This may lead to far-reaching improvement lasting for years even in apparently quite severe cases.

MENTAL AND NERVOUS DISORDERS ASSOCIATED WITH PELLAGRA.

Singer⁵ says that mental disturbance occurs in about 40% of all cases of pellagra. Such disturbances are more frequent with repeated attacks. Children are practically exempt. They are most common in men between 21 and 40, and in women between 41 to 60. About 95% of the mental disorders are the direct result of the pellagrous intoxication, and although the mortality in such cases is much higher than in cases without such disorders, yet the mental disturbance will fully recover if the patient survives. They correspond to similar disturbances in other somatic diseases, and in such case, are often described as not "insanity." The remaining 5% are examples of mental disorder primarily dependent on the individual's make-up, or else are merely concomitant. Faulty nervous organization, including inadequate mental adaptability, seems to be associated with a predisposition to pellagra. This seems to afford the most satisfactory, even if only partial, explanation of the extraordinary frequency of pellagra arising among the insane, the increased frequency of functional psychoses and psychoneuroses, and of nervous disease of the congenital anomaly type among pellagrins as compared with more normal individuals. Chronic "insanity" due strictly to pellagrous intoxication, if it occurs, is rare. Chronic nervous disease as the result of pellagra, if it occurs, is exceptional.

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CANCER.*

DR. E. REYNOLDS: By the term "cancer" is meant here malignant disease of either histological type; we shall use carcinoma and sarcoma in those instances where it seems best to be more specific.

Statistics in regard to the prevalence of cancer show that of all diseases of adult life it has the greatest mortality and is second to tuberculosis in mortality of general diseases (*i.e.* adult) and to infantile diseases. Seventy-five thousand to eighty-five thousand die of cancer every year in the United States. Of those who reach the age of 40, one out of every eleven dies of cancer,—one woman in eight, one man in fourteen.

Preventive treatment would do away with by far the greatest amount of cancer mortality, and this enormous improvement can be made if the laity know what they should know, and if the medical profession become proportionately well informed. One of the chief agents in spreading this requisite knowledge is the American Society for the Control of Cancer, which, through affiliations with research and other institutions connected with the problem of cancer control, acts as a clearing-house and dispensary for the most valuable recent information regarding cancer. Through its executive committee, which is composed of some of the most reliable and intelligent surgeons and pathologists dealing with cancer, this society has also done much to crystallize the present applicable knowledge in regard to the nature and treatment of the disease in question. Though we know nothing worth talking about in regard to the exact causes in the origin and spread of the disease, our knowledge of the treatment is pretty thoroughly good. The essential principle in the modern view of cancer is that no sharp division can be made between benign and malignant growth. Also, in distinct contrast to previous teaching, we teach the diagnosis of neoplasm nowadays in (a) the precancerous or benign stage, when operation affords nearly 100% immunity; (b) in the incipiently malignant stage, where operation gives a fair chance against the occurrence of generalized cancer; and (c) in the stage of established malignancy, where but a poor chance is given by operative treatment.

Like most configurations, cancer begins as a localized process, controllable but uncontrolled, which, given time, increases locally until so large that metastases break off like brands, to accomplish general ruin.

DR. R. B. GREENOUGH: The cause of cancer is unknown. The influence of heredity was for a long time thought to be of importance. Later its influence was taught to have been overestimated, and now again it has come under consideration in view of the fact that mice have been proven to show hereditary susceptibility to the spontaneous occurrence of cancer.

We have various theories which fit certain special types of cancer very satisfactorily, *c.f.* (a) Cohnheim's theory of embryonic rests, which explains adequately the adrenal tumors of the kidney and certain types of neuroblastomes. (b) The theory of chronic irritation or repeated insult, of which x-ray cancer is the commonest example. The Kangri cancer of Kashmir,—epidermoid cancer of the ab-

dominal wall found in a country where the carrying of hot stoves against the abdomen is a common custom,—is another example of this class.

It may be that under the influence of repeated chronic irritation, cells can revert to the embryonal stage, as, for example, the cells of the bone marrow do after a severe hemorrhage. This explanation, however, gives little help in explaining either the local cancer of the breast or the more generalized systemic diseases, like leukemia and the lymphomata, which are closely related to tumors if not actually recognized as such.

The two important factors in the course and prognosis of a given tumor are: (a) type of the malignant growth; (b) situation and direction of extension.

The problems of cancer as it occurs in general practice are, first, those of diagnosis, and, second, those of treatment. The general practitioner hesitates to make an early diagnosis on very slight evidence lest he be accused of being an alarmist, and, therefore, often waits long and patiently for the "typical picture" before he makes his diagnosis and brings the patient to operation. The "typical case" is the advanced case. Physicians must remember that if they wait for more typical cancer symptoms they are waiting for a proportionately more incurable condition. The handling of the early, doubtful cases, however, is a difficult and delicate problem. Excision of a doubtful tumor of the breast, with closure of the wound, while waiting for a pathological report, is practically certain, if the disease proves to be carcinoma, to deprive the patient of her chance for a cure by radical operation. Incision into the tumor at the time of operation, for diagnostic purposes, is also to be avoided if possible, and the use of the cautery in such cases is much to be preferred. As a general rule, the excision of a doubtful tumor by a wide margin, with the use of the cautery in the more suspicious cases, and especially in such situations as the breast and other organs not directly on the surface, will be found to be the safest plan.

Malignant tumors of different organs have each their own methods of extension. In general, carcinoma extends through the lymphatics, and sarcoma by the blood vessels. Adrenal tumors have a special predilection for cerebral and bone metastases, while carcinomata of the breast and of the prostate appear to have a special ability to metastasize in bone.

DR. REYNOLDS: Cancer of the Uterus. There are two distinct types, differing microscopically, in natural history, in method of treatment, and in prognosis.

(a) Cancer of the cervix is a squamous cell carcinoma which appears first as an ulcerative or sometimes a proliferative process following chronic inflammatory erosion. It has a long precancerous stage of surface ulceration, but a rapid course once it becomes true cancer. The preventive treatment is an early "minor" radical operation,—amputation of the cervix well above the diseased area, with a pathologist in attendance at the operation to examine the excised part for signs of an already established malignancy. The extension in the cervical cancers is by the lymphatics, and is rapid. The symptomatic indication for cervical amputation is bloody, irritating leucorrhœa persisting in a woman thirty-five to fifty years old.

(b) Cancer of the fundus begins as a glandular hypertrophy at a time when there should be

* Abstract of Joint Lecture on Feb. 25, 1916.

atrophy. Proceeding deeper and deeper, the glandular structures take on the character of adenomata, and eventually of carcinoma. In contrast to the cervical tumor, cancer of the fundus remains operable late in the process of the disease, and does not travel by the lymphatics but by extension, often along the ovarian artery. The most serious feature is the budding of bits of malignant tissue into the peritoneal cavity, separation, and thus metastasis, to any portion of the peritoneal surface. The symptoms are slight irregular increase in the menstrual flow, especially significant if between catamenia, eventually becoming slightly pinkish serous exudate. This condition in a woman in the late forties is the nearest to a pathognomonic sign one could ask for. The treatment is curettage, with pathologist present to determine the nature of the curettings, and full preparations made to proceed to hysterectomy then and there if need be. If a pathologist cannot be obtained, it is a question for the surgeon's conscience to decide,—whether the patient be referred to a place where expert opinion is obtainable, or be allowed to be curedtted and wait for radical operation.

DR. GREENOUGH: Cancer of the Breast. Statistics show that even at present, when the various operations for breast cancer and their indications have become standardized and well known, the percentage of cures of cancer of the breast is low; 30-40% of the cases have a 3-5 year freedom from recrudescence, but recrudescence after 9 to 12 years occasionally happens. About 80% of the cases which come to a general hospital are beyond the possibility of cure. Surgeons who operate on less favorable cases have less encouraging results to report than the men who accept nothing but the most suitable cases.

The diagnosis of cancer of the breast is usually made on anatomical findings,—a lump, often hard, in the mammary tissue, often accompanied with axillary glandular involvement, in a woman over twenty-five to thirty.

The standard radical operation involves the removal of the entire breast with its skin, the pectorales, major and minor, the deep fascia of the chest wall, the contents of the axilla, excepting the larger veins, arteries and nerve trunks, and as much of the lymphoid tissue in the neck as the individual case indicates.

The best judgment in operative procedure is to do a radical removal, where the diagnosis of cancer is reasonably sure, even if it is not positive. When the diagnosis is doubtful but in favor of non-malignancy, it is well to excise with cautery, rather than with knife. This last warning is based on the experience at the Massachusetts General Hospital, that in cases where a supposedly benign tumor was excised with the knife, and proved malignant on subsequent pathological examination, the results were uniformly fatal.

The differential diagnosis of cancer of the breast is of much importance because the indications for operations are so inclusive as to commit us to many unnecessary operations. The most common condition to be differentiated from cancer is cystic disease, which differs in not being sharply localized, in not being adherent to the skin, in producing no axillary involvement, and in being painful during catamenial periods in some patients. Ten to fifteen per cent. of cystic disease develops into cancer, so that removal is indicated in case of there being any accompanying induration. It is exceedingly hard

to differentiate fibromata late in life, as they resemble cancer very closely, often with loss of skin mobility over them. It is also hard and probably less important to differentiate chronic abscess from cancer of the breast.

The types of cancer of the breast are the medullary and scirrhus, easily recognized microscopically, but clinically less important to differentiate; adenocarcinoma, grows outward, and has considerable bulk, but is slow to generalize. Colloid carcinoma produces degeneration of the cells and stroma, with low vitality and slow growth of cells. The prognosis in adenocarcinoma and colloid cases is much better than in the medullary and scirrhus types.

DR. REYNOLDS: Cancer of the Ovary. This condition is rarely primary. A few of the cystomas in the later stages undergo cancerous degeneration of the living membrane, and the deeper layers are invaded by direct extension. Dermoids may become malignant if neglected. Solid tumors arising from the corpus luteum are likely to be malignant in the end, but are comparatively rare.

Cancer of the Kidney and Bladder. Clinically you cannot speak of these apart from each other, but their symptoms,—infrequency and hematuria,—being eminently characteristic of stone, they must be differentiated from stone by careful direct observation. Cancer of the bladder usually begins as papilloma, which may often be seen by cystoscope. The treatment is immediate excision of the papilloma, together with the surrounding part of the bladder. If the cancer is extensive the whole bladder can be removed and the ureters led into the rectum, external skin surface, or vagina. These cases, however, usually die in one or two years from infection of the kidney.

If the symptoms continue, the kidney should be x-rayed, and tumor may be found there as well.

In this question of cancer, the physician is on the horns of a dilemma; he must choose a course between that of an alarmist and that of a timid loser.

DR. GREENOUGH: Cancer of the Tongue. This is a squamous epidermoid neoplasm, producing very few vacuole metastases, but rapid in extension to the floor of the mouth, and one of the most resistant of cancers to radical operative treatment. The radical operation requires marked vigor on the part of the patient; the cures are 15-20%. Only one-third of all cases in a ten-year series at the Massachusetts General Hospital were suitable for operation. Cancer elsewhere in the buccal mucous membrane resemble those of the tongue, except that in cases of cancer of the upper jaw the operative risk is smaller. The Whitehead operation consists of cutting the muscles at the base of the tongue, drawing it forward through the mouth and then doing the dissection of the neck as a separate operation. This method is adapted only to the very early cases. Removal through the floor of the mouth smears all the neighboring tissues and is, therefore, to be criticized. Division of the jaw is a very severe operation and removal of the jaw has a 25-30% mortality of itself.

In cancer of the lip the percentage of cures is high, presumably because of the probability of earlier diagnosis and the accessibility of the part. In these cases there is evidence of embolic infection in the lymph glands of the neck, because there is no direct chain of metastases down to the glands. The dissection of the neck glands is done in a separate block; 90-100% are cured when the neck glands are not involved, 40-60% is the proportion of cures

when there is involvement. A V-shaped piece containing the neoplasm is removed from the lip, together with the submental and submaxillary lymph nodes. The deep carotid nodes are removed with the internal jugular vein in cancer of the tongue. The vein is usually left in in cancer of the lip, but it is dissected clean of glands.

DR. REYNOLDS: Cancer of the Colon. This is a condition especially liable to be overlooked, and in making the diagnosis the value of a comprehensive series of bismuth plates and the findings from proctoscopy must be borne in mind. Compared with these measures, plus the symptoms, palpation is unimportant, especially if no mass be felt. The suggestive symptoms are gas colic, diarrhea, bloody stools and abdominal pain. The operability of cancer of the colon depends on the location and on the length of the mesentery, growths above the splenic flexure having a specially good prognosis. Though the proctoscope often affords inspection to a remarkably high point, the examiner usually is not able to see the mass, and diagnosis is often made correctly without positive proctoscopic evidence.

Dr. GREENOUGH: Cancer of the Stomach. Time prevents our consideration of this condition at all adequately. As in cancer of the colon, the importance of an early diagnosis overwhelms all other points. The 30-33% of successful pylectomies and gastrectomies of the Rochester Clinic is higher than the averages elsewhere.

Dr. REYNOLDS: General Principles of Radical Operation. Do not disturb the malignant tissue. Let the pathologist be the first to incise the pathological tissue. All incisions should be confined to normal tissue; if the dissection must come near the cancer (as in axillary lymph tissue excision) it should be done by blunt dissection, sweeping toward the periphery.

Dr. GREENOUGH: The Use of Radium and X-ray. In cancers of the skin or in superficial growths which are persistent and active, some sort of radical treatment is necessary. Radium and x-ray are of value in retarding or destroying certain superficial types of growth, but have not yet justified as much as it was hoped they would accomplish. X-rays are of relatively slight value, but radium is distinctly valuable in the treatment of readily accessible epidermoid cancers. Where the epidermoid has burrowed deep and into the bone, radiation has little effect. The scars left by radiation are unusually soft and pliant. In splenic myelogenous leukemia radium applications have had marked effect in reducing the size of the spleen and of the white count (775,000 in March, 25,000 in July), and in controlling the extent of recurrent symptoms. Cancer of the cervix is susceptible to radium, but its metastases are not affected, and in the same way the metastases of breast cancer are not affected, though it is possible to kill superficial local recurrences. A large number of the ulcerative forms of cancer show improvement under radiation; so that we recognize the cases in groups as being:

- (a) Superficial cancer, which radium destroys,
- (b) Ulcerated deeper forms of cancer, which radium improves temporarily,
- (c) Advanced cases, in which radium appears to have no favorable effect.

R. B. GREENOUGH, M.D.,
ALAN GREGG, A.B.

MEDICAL MEETING.

*Amphitheatre of the Peter Bent Brigham Hospital
on Tuesday Evening, February 29, at 8.15 o'clock.*

DR. HENRY A. CHRISTIAN, president, in the chair.

Abstract of paper by Dr. EUGENE F. DUBOS of New York on "The Respiration Calorimeter in Clinical Medicine":

In these days, when housewives speak in terms of calories and the newspapers deal with vitamins, it may be well for clinicians to examine once more the fundamental principles of nutrition. Patients no longer demand medicines, but they do expect diets, and if they are at all up with magazine literature, they are better informed on the subject than the text-books which most of us studied in the medical schools.

The science of nutrition in disease must be founded upon experiments in calorimetry and the respiratory metabolism. The word metabolism indicates the transformation of matter and refers to the breaking down of foods, to their absorption, and to the building up of body tissues. The term also refers to the oxidation of foodstuffs and of body tissues, with the consequent liberation of warmth and energy.

In the years between 1892 and 1908 there was no work being done on this subject in our American hospitals, although Atwater and his successor Benedict, in Middletown, were making classical experiments on normal men, and Lusk, in New York, was making similar experiments on dogs. During the same period in Germany the respiratory metabolism was being studied in a dozen clinics, and the investigators were hoping that at some time means would be found to apply the apparatus of Atwater and Benedict to the study of disease, since this alone would solve certain problems. About seven years ago, Benedict and Joalín, here in Boston, began to study the respiratory metabolism of diabetes, and four years ago investigation of the gaseous exchanges of typhoid patients was begun in Bellevue Hospital. Shortly afterward the directors of the Russell Sage Institute of Pathology decided to turn over their funds to Prof. Graham Lusk for a period of five years in order that a calorimeter might be built and maintained in Bellevue.

The calorimeter itself consists of a copper box about the size of the lower berth of a sleeping car. It contains a comfortable bed and is provided with two windows, a shelf, a telephone, a fan, a light, and a Bowles stethoscope for counting the pulse. The ordinary experiment takes about as long as a trip from New York to New London, and there is an agreeable absence of cinders. Patients, as a rule, doze from time to time, or else try to work out some scheme by which they can amuse themselves without moving. After three or four hours they are rather bored by the quiet, and the observations are not prolonged beyond this time. They are allowed to turn over in bed once or twice an hour, but reading and telephoning are discouraged, since these increase the metabolism. The air in the box is fresh and pure, the patient suffers no discomfort, and objections to the procedure are very infrequent. Most of the patients are only too glad of the extra attention, and they insist that the calorimeter has a marked therapeutic value.

The apparatus has two distinct functions: (1) the physical measurement of the heat production of an individual by the method of direct calorimetry; (2) the chemical measurement of his gaseous exchanges and the calculation of the heat by the method of indirect calorimetry. Both depend on the fact that the apparatus is a closed circuit, absolutely shut off from the surrounding atmosphere in such a manner that everything eliminated by the subject is caught and measured.

The main object of all investigators has been to determine the heat production of the patient while at complete rest fourteen hours or more after the last meal. This is the so-called basal metabolism, and is of interest only when compared with the figures obtained on normal individuals. Since it is impossible to measure the metabolism of many of our patients when they are entirely recovered, it is necessary to calculate what the man's metabolism would be were he normal. Here lies the most difficult problem. Controversies have raged more fiercely about the normal controls than about the pathological cases. It has been said that a man is as old as his arteries. It may also be said that a piece of research work is as good as its normal controls.

The normal controls used by investigators up to the last few years often showed a variation of 50% above or below the average. This variation in the normals was largely due to the manner in which the results were expressed. Part of the error is eliminated if we express the result in calories, and still more eliminated if we base our calculations on surface area rather than body weight. Mr. Delafield DuBois has devised a method of measuring the skin area which has been applied to ten individuals of every conceivable shape. He has found an average plus error of 16% in Meek's formulae and an error of 38% in fat subjects. To correct these the so-called "linear formula" has been devised and also a simpler formula based on height and weight. We now feel certain that with men between the ages of twenty and fifty the metabolism of each individual is proportional to his surface area, whether he be short or tall, fat or thin.

As I have said, the basal metabolism is measured fourteen hours or more after the last meal because food stimulates the metabolism. This is due to the so-called specific dynamic action of foods, and is greatest in the case of protein and least in the case of carbohydrate. The phenomena, first discovered by Rubner, have been studied in great detail by Lusk, using the dog calorimeter at the Cornell Medical College. He has found that the specific dynamic action of protein is due to the stimulus of the metabolism products of amino-acids acting upon cell protoplasm, and that, although the preliminary cleavage products of fat and carbohydrate do not appear to be direct stimuli, yet when they are present in excess in the fluid bathing the cells, the heat production is increased.

Metabolism in Disease. The most striking disease from the standpoint of changes in the total metabolism is exophthalmic goiter, and clinicians who pay no attention to the gaseous exchanges neglect the most important phase of this malady. In general it may be said that very severe cases show an increase of 75% or more, severe cases 50% or more, moderately severe and mild cases less than 50%, while a few mild, atypical or operated cases may be within normal limits. In regard to the medical treatment of Graver's disease the calorimeter may be

a therapeutic nihilist, but it is a dietic enthusiast, and it is also a strong supporter of the belief that mental and physical rest are essential in the treatment of severe cases.

The effect of the Allen fasting in diabetes in the severe case most completely studied was to cause a gradual rise in the quotient as the D: N ratio fell and the glycosuria cleared up. After the fast the curious phenomenon mentioned by Joelin was noted. There was a rise in quotient indicating the combustions of carbohydrate from some unknown source. This may be stored glycogen, excess of sugar in blood and tissues, or perhaps it may be due to the oxidation of acetone bodies. Another effect of the fast was the marked fall in total metabolism.

The total metabolism in typhoid fever shows an increase which is roughly proportioned to the rise in temperature. Patients who are liberally nourished with high calory diet of Coleman and Shaffer do not have a greater heat production than patients on low diets. Peabody, Mery and DuBois have studied sixteen patients with cardiovascular disease. It may be said in general that mild cases of nephritis and compensated cardiac patients are within normal limits, as are a few severe cases of both diseases. An increase in heat production amounting to 30 or 40% is found in most of the very dyspeptic patients of the type in which acidosis is often present.

(Lantern slides were shown to illustrate the paper).

Discussion by Drs. F. E. Benedict, W. M. Boothby, F. B. Talbot, J. H. Means of Boston and Dr. L. H. Wilson of Rochester, Minn.

Emmett G. Gary, M.D.

Book Reviews.

Laboratory Methods. By B. G. R. WILLIAMS, M.D., and E. G. C. WILLIAMS, M.D. Third Edition. St. Louis: C. V. Mosby Co. 1915.

The previous (second) edition of this textbook of laboratory methods was reviewed in the issue of the JOURNAL for October 16, 1913, (Vol. cxix, page 580). It is designed with special reference to the needs of the general practitioner. In this third edition a few new procedures have been added in the text, but the majority have been placed in an appendix. Among the chief of these are the elastic tissue stain, the salting out method for tubercle bacilli, a simple gram stain, an invariable blood stain, a dressing for laboratory tables, and a number of other notes. The book retains its interesting and commendatory introduction by Dr. Victor C. Vaughan, and the forty-three excellent engravings with which it is illustrated. It should retain its useful individuality among the multitude of laboratory manuals now in existence.

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All letters containing business communications, or referring to the publication, subscription, or advertising department of the Journal, should be addressed to

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THE BOSTON CITY HOSPITAL.

The recently published fifty-first annual report of the trustees of the Boston City Hospital records the activities and progress of that institution and its many branches for the year ended January 31, 1915. Statistics are presented of the Hospital proper, the South Department for Infectious Diseases, the Haymarket Square and East Boston Relief Stations, the Convalescent Home at Dorchester, and the Training School for Nurses. During the period covered by the report there was treated in the hospital wards and the South Department a total of 16,498 patients, with a mortality rate of .096. The number of out-patients treated during the year was 43,891, who made a total of 143,462 visits. The total number of patients admitted to the wards since the opening of the Hospital and the South Department has been 365,050, and the number of out-patients has been 1,003,282.

In November, 1915, an orthopedic shop was opened at the Hospital, and since that time 393

patients have been supplied from it with different kinds of apparatus. During the past year 279 out-patients have been supplied with apparatus, and these patients made a total of 680 visits to the shop.

The South Department has continued its important activities in the control of contagious diseases in this community. The following is an extract from the report of the advisory board of this department:

"Twenty-six hundred and ninety patients were admitted to the South Department in 1914, which is 287 more than were received the previous year.

"The South Department has been taxed to its fullest capacity. While there has been no real epidemic of scarlet fever, diphtheria or measles, yet the number of scarlet fever cases has far exceeded the average for the past few years.

"Because of the confidence displayed by the public in this department and consequent yearly increase in the number of patients, this department has far outgrown the needs as anticipated twenty years ago upon its inauguration. Because of the number of scarlet fever cases it became necessary to request of the Board of Health the temporary use of the hospital at No. 106 Southampton Street, which was done on March 13, 1914; and later money was transferred from the reserve fund to the hospital fund for maintenance of the same."

Particular attention should be directed to the work of the surgical department. During the year covered by the report, 6021 surgical cases were treated in the wards of the hospital and 18,188 in the surgical out-patient department, to which a total of 85,658 visits were made. With this should be regarded also the work of the two relief stations, which is essentially surgical. During the thirteen years of its establishment the Haymarket Square Relief Station has treated 456,293 patients, of whom 41,206 were during the year covered by the report. These patients received 42,994 days' treatment at an average cost of 91 cents per day. The East Boston Relief Station, during the six years of its operation has treated 85,450 patients, of whom 12,987 were during the year covered by the report. These patients received 35,416 days' treatment at an average cost of 54 cents per day. Early in the year there was placed in the surgical out-patient department a paid dresser, which has tended to dispose more rapidly of the surgical cases. We are convinced that the work of the surgical department in all its divisions is maintained at a high standard.

of efficiency and of regard for the welfare and comfort of patients and that statements previously made to the contrary by prejudiced persons are without foundation in fact.

Particular attention should be called also to the adoption by the Hospital of the new system of loose leaf records based upon the Bellevue Hospital system, but modified to suit the needs of the City Hospital, and established for all its departments. In practice this system has proved to work exceedingly well and its adoption is a credit to the far-sighted policy of the trustees, since it increases greatly the value and accuracy of the hospital records.

The department of vaccine and serum therapy has carried out its work with painstaking assiduity.

"The total number of patients receiving bacterial vaccines was 632; number of visits to this clinic, 3,447; number of vaccine inoculations, 2,833. The total number of patients under antisyphilitic treatment was 327. Number of cases of syphilis of the central nervous system treated by intradural injection of salvarsanized serum or under observation, 81. The total number of visits for this treatment (exclusive of visits for salvarsan injection) was 1905. The number of salvarsan injections was 766; mercury injections, 311; blood taken for Wassermann and Schwartz tests, 798. Total number of recorded cases under observation and treatment, 1040."

During the year a number of changes in the rules have been made. New rules were established for the admission of patients.

"The following new positions in the medical and surgical staff were created: a consultant on contagious diseases, a physician in tropical diseases, two positions as dentist, a temporary assistant to the physician for x-ray service.

"A fourth surgical service and a fourth medical service were established, the third and fourth medical services being made continuous. "The titles of the physicians connected with the neurological department were changed to conform with the nomenclature in other departments."

There was also established at the Hospital a department of medical social service, whose progress and valuable activities were discussed editorially in the issue of the JOURNAL for February 17.

The report presents further elaborate statistics of the detailed work of its departments. The Training School for Nurses has completed its thirty-sixth year. During the period covered by the report, forty nurses were graduated,

and on January 31, 1915, 236 remained in the Training School. Throughout the Hospital the year was one of increasing activity and of progress, carried forward with credit to all concerned in the work of this leading medical and municipal institution.

THE MEDICAL RECORD, A SEMI-CENTENNIAL.

It is a great pleasure for the JOURNAL to extend its cordial congratulations to its New York contemporary, the *Medical Record*, which, with its issue of March 4, 1916, completes the first half century of its existence. The *Record* has been remarkable and fortunate that during this period it has had but one change of editors, Dr. George F. Shrady, the first editor of the publication, having guided its course from 1866 to 1904. We can wish no better fortune to the *Record* than that its present editor may have as long a service.

With the portrait of Dr. Shrady, which appears in the fiftieth anniversary number of the *Record*, are published also likenesses of some of the distinguished authors whose contributions have appeared in its columns,—Dr. Gordon Buck, Dr. Austin Flint, Senior, Dr. Alfred C. Post, Dr. T. Gaillard Thomas, Dr. W. H. Van-Buren and Dr. Elkanah Williams. These names and personalities recall many of the notable events in the progress of medical science during this half century, which is well summarized in an article appearing in this memorial number on "Fifty Years of Medical Progress."

The *Medical Record* is to be congratulated upon the part which it has played in this half century of progress and upon the auspicious prospects with which at this semi-centennial epoch it enters upon its future of continued service to the science and profession of medicine.

THE BOSTON MEDICAL LIBRARY.

In former years we have, from time to time, called the attention of our readers to the important work done by the Boston Medical Library as an agent in the diffusion of medical knowledge and as a collector of one of the largest groups of medical literature in the

United States. In the issue of the JOURNAL for January 27 we commented editorially on the recently published fortieth annual report of the Library, presenting the statistics of its growth and particularly of its progress during the past year.

The Library has, at present, 484 Fellows and 270 associates, a small membership compared with the number of physicians in Boston and its vicinity. During 1915 the net gain in membership was only 24. The Library, however, is extensively used, much more, it appears, by non-members than by members. During 1915 the Library was visited by members 4160 times and by non-members 7985 times. During the year also, 64 medical society meetings were held in the Library building.

It is obvious that the Boston Medical Library serves an important and valuable function in the medical life of the community, in the development of medical science, and in the furtherance of medical education. Its doors are freely open to medical students and to members of the profession. It should be regarded as the duty and privilege of that profession adequately to support the institution by financial contributions. Any medical graduate of less than five years' standing or any physician not resident in Boston may become an associate member at an annual fee of \$5.00. Physicians living in Boston, who have been in practice more than five years, must become Fellows, at an annual fee of \$10.00. Life membership, at a fee of \$200 is of particular value to the Library, since from these fees an endowment fund will be slowly developed. Any person with a degree in medicine or science is eligible for membership. It is earnestly to be hoped that the profession will realize its responsibility in the maintenance of one of the distinguished and most worthy of Boston medical institutions.



TWO NEW MEDICAL JOURNALS.

It is a pleasure to chronicle the initial appearance of two new American medical journals, the *Journal of Cancer Research* and the *Journal of Immunology*. Both these periodicals are published in Baltimore with English offices at the Cambridge University Press, London.

The *Journal of Cancer Research* is to be edited by Dr. Richard Weil with an editorial committee representing the American Associa-

tion for Cancer Research, whose proceedings are published in the *Journal*. On this committee Dr. Joseph C. Bloodgood is the representative of Johns Hopkins University, Dr. Leo Loeb of Washington University, Dr. Ernest E. Tyzzer of Harvard University, Dr. Weil of Cornell University, Dr. H. Gideon Wells of the University of Chicago, and Dr. William H. Woglom of Columbia University. The *Journal of Cancer Research* is to be published quarterly, its first issue being dated January, 1916.

The *Journal of Immunology*, a bi-monthly publication, whose first issue is dated February, 1916, is the official organ of the Society for Serology and Hematology and of the American Association of Immunologists. It is to be edited by Dr. Arthur F. Coca, with an international advisory board of nine, and an editorial board of thirty-six members. The advisory board consists of Dr. Simon Flexner, Dr. William H. Park and Dr. Theobald Smith, of New York; Dr. Ludwig Hektoen, of Chicago; Dr. Robert Muir, of Glasgow; Dr. F. Nuttall of Cambridge, England; Dr. V. C. Vaughan of Ann Arbor, Mich.; Dr. William H. Welch, of Baltimore; and Dr. A. E. Wright of London. The Boston members of the Board of Editors are Dr. Milton J. Rosenau and Dr. Richard P. Strong of the Harvard Medical School.

The JOURNAL extends its most cordial and confident good wishes for the prosperity and the success of these two new special publications of medical science.

DEATH OF DR. RODMAN.

DR. WILLIAM L. RODMAN, president of the American Medical Association, died of pneumonia at his home in Philadelphia on Wednesday, March 8, 1916. He was born in Frankfort, Ky., in 1858, and received his medical education at the Jefferson Medical College. In 1899 he was appointed professor of surgery at the Medico-Chirurgical College, Philadelphia, and held this position until his death. He was president of the American Medical College Association in 1902; and in June, 1915, he was installed as president of the American Medical Association at its sixty-sixth annual convention in San Francisco. He was also a member of the American Surgical Association, the Pennsylvania State Medical Association, the Kentucky State Medical Society, the Philadelphia Academy of Surgery, the Philadelphia Pathological Society

and the International Surgical Society. Dr. Rodman had an international reputation as a surgeon and as an authority in the study of cancer. His recent visit to Boston to address the Surgical Section of the Suffolk District Medical Society on the surgery of duodenal ulcer has left a particularly pleasant and vivid remembrance of his personality with the profession of this city. His untimely death is a grave loss, not only to the American Medical Association, but to medical science.

MEDICAL NOTES.

UNION OF TWO MEDICAL JOURNALS.—It is announced that the *American Journal of Gastro-Enterology* has combined with the *Proctologist* as a quarterly journal under the name of *The Proctologist and the Gastro-Enterologist*. The editorial staff will consist of Dr. Rollin H. Barnes, St. Louis, Proctology; Drs. Anthony Bassier, New York, and Lewis Brinton, Philadelphia, Gastroenterology; and Dr. A. L. Benedict, Buffalo, Dietetics.

MEDICAL SOCIETY OF THE MISSOURI VALLEY.—The twenty-eighth semi-annual meeting of the Medical Society of the Missouri Valley will be held on Thursday and Friday of next week, March 23 and 24, at St. Joseph, Mo., under the presidency of Dr. John P. Lord of Omaha, Neb. The scientific program will comprise twenty-five papers and two orations. Invitations have been extended to the presidents of state societies and representatives of the United States Public Health Service. The secretary of the society is Dr. Charles Wood Fassett of Kansas City, Mo.

PREVALENCE OF MENINGITIS, POLIOMYELITIS, SMALLPOX AND TYPHOID FEVER.—The weekly report of the United States Public Health Service for Feb. 25 states that during the month of January, 1916, there were reported in Massachusetts 15 cases of cerebrospinal meningitis, 4 of poliomyelitis and 82 of typhoid fever. During the same period there were 10 cases of meningitis in Wisconsin and 9 in Maryland. There were 170 cases of smallpox in Minnesota, 150 in Wisconsin and 99 in Michigan. There were 90 cases of typhoid in Maryland, 88 in Michigan, 84 in Louisiana and 54 in Minnesota.

In the weekly health report for March 3, it is stated that during January, 1916, there were 4300 cases of malaria and 364 of pellagra, 262 of typhoid fever and 214 of smallpox in Mississippi; 10 cases of cerebrospinal meningitis in California; 14 cases of poliomyelitis in Virginia. In Ohio there were 22 cases of smallpox and 210 of typhoid fever. There were 219 cases of smallpox in Kansas and 217 in Iowa.

HEALTH OF NEW YORK CITY LAST WEEK.—According to Registrar Guilfey, figures com-

piled at the Department of Health show that during the week just closed 1628 persons died in the city of New York, as compared with 1518 during the corresponding week of 1915, the respective rates being 15.20 and 14.52 per 1000 population. The difference is equivalent to an increase of 72 deaths. By an odd coincidence the number of deaths is exactly the same during the past week as during the previous week. Fewer persons died of contagious diseases last week than during the corresponding week of last year, or during the previous week of this year. The deaths, however, from influenza and the respiratory diseases, were slightly more numerous during the past week than during the week ending Feb. 27, 1915. Four hundred and seven (407) deaths were reported as due to organic heart disease and nephritis, as compared with 356 deaths reported as having been due to the same cause during the corresponding week of last year. Eleven more deaths were reported as due to pulmonary tuberculosis than during the week ending Feb. 27 of last year; this increase is due solely to the larger population of this year. Considered from the viewpoint of age distribution, the deaths of children under one year and under five years of age were fewer than during the corresponding period of last year, while the deaths of the higher age groupings were more numerous. During the first nine weeks of 1916, the death rate was 16.03, as compared with 14.77 for the corresponding period of 1915.

SANITARY CONDITION OF BOTTLED WATERS.—The United States Bureau of Chemistry for several years has been investigating the sanitary conditions in the production and distribution of bottled mineral and table waters, which are offered for sale in interstate commerce and therefore subject to the Food and Drugs Act. It is recognized that the sale of bottled waters is dependent largely upon the belief by the public in the purity of the product. The bureau has recently conferred with a large number of sanitary experts and bacteriologists regarding a desirable standard for judging the sanitary character of bottled waters. As a result of the investigational work and the above-mentioned conferences, the bureau believes that the tolerances established by the Public Health Service of the Treasury Department for waters served on interstate carriers is none too rigid for application to bottled waters sold in interstate commerce or imported from foreign countries. The Treasury Department standards are as follows:

1. The total number of bacteria developing on standard agar plates, incubated 24 hours at 37° C., shall not exceed 100 per cubic centimeter; provided, that the estimate shall be made from not less than two plates, showing such numbers and distribution of colonies as to indicate that the estimate is reliable and accurate.
2. Not more than one out of five 10 c.c. portions of any sample examined shall show (by the

method of the Public Health Service) the presence of organisms of the *Bacillus coli* group.

LIBRARY OF THE PHILADELPHIA COLLEGE OF PHYSICIANS.—In its annual report the Library Committee of the College of Physicians of Philadelphia record the acquisition of a number of rare and interesting volumes. Among them may be mentioned a five-volume Aldine edition of the works of Aristotle dated 1495. It is a superb copy of the first edition of the work of Aristotle, printed in Greek characters. The value of this work is increased by the fact that it was one of the earliest examples of books printed entirely in Greek characters. Dr. Fielding H. Garrison says: "The greatest scientific name after Hippocrates is that of the 'Master of those who knew.' the Asclepiad Aristotle (384-322 B.C.), who gave to medicine the beginnings of zoology, comparative anatomy and embryology, and the use of formal logic as an instrument of precision."

There is also a Bevilauqua edition, 1497, of the work of Julius Firmicus Maternus, "De Naturitatis."

This is a first edition with a good example of a xylographic Gothic title, and a woodcut printer's device on the last page. This work is quite rare, and, while not medical as a whole, contains much pertaining to medicine.

A volume dated 1513 by Eucharius Röslin, called "Der swangern Frauwen und Heebamen Rosengarten," is a first edition of the first work printed on obstetrics. This work is based on a manuscript by Moschion, a writer of the second century. The "Rosengarten" was translated into English by Thomas Raynald, under the title "The Birth of Mankyn." The binding is an excellent example of early sixteenth century German work. A very rare and beautiful specimen from the first press at Augsburg is a volume by Rodericus Sanctius, Bishop of Zamora, called "Speculum Vitae Humanae," dated 1471. This is the earliest dated book in the Library of the College. The Library also reports a complete copy of the *Anatome Topographica* of N. I. Pirogoff, who was the greatest Russian surgeon of his time, and who is remembered today by his operation of amputation of the foot—"Pirogoff's amputation." His Anatomy, a monumental work of great value, in which frozen sections were first used in the process of illustration, seems almost unknown to the present generation.

NEW JERSEY STATE HOSPITAL.—The fortieth annual report of the New Jersey State Hospital, at Morris Plains, N. J., is at hand. During the year there were admitted to this hospital 606 patients, 303 men and 303 women; this is more admissions than in any year since the opening of the institution in 1876. The year closed with a greater increase of patient population than in any preceding year of its existence. The average yearly increase since 1892 has been about

100, while the increase for the past year was 160. The year ended with a population of 2669—1335 men and 1334 women. The per cent. of recoveries is 15. In former years, under more favorable housing conditions, the percentage has been as high as 35.89. The hospital's overcrowded condition has made impossible the proper assignment of sleeping quarters to a large percentage of unimproved patients whose mental condition would undoubtedly have been benefited under proper classification and suitable accommodations. Over 43% of the admissions were foreign born.

HEALTH OF SCHOOL CHILDREN.—The Bureau of Education, Department of the Interior, at Washington, has recently issued a pamphlet, Bulletin 1915, No. 50, called "Health of School Children." It is compiled by W. H. Heck, professor of education, University of Virginia, and contains seventy-three articles on subjects relating to the health of children in public schools. The articles have been reprinted from various American medical journals published during the year of July, 1914 to July, 1915. Among them may be mentioned: "A Definite Plan for a System of Health Supervision of School Children in Ohio," by P. Bruce Brockway, M.D.; "Medical Inspection of Open-Air Schools," by John Aikman, M.D.; "County Health Organization in the United States," by Louis I. Dublin, Ph.D.; and "Prevention of Schoolroom Diseases and Dust," by C. Ward Crampton, M.D. Copies of this pamphlet may be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 20 cents per copy. A similar compilation, Bulletin, 1915, No. 4, was published of articles printed during the previous year.

EUROPEAN WAR NOTES.

AMERICAN AMBULANCE HOSPITAL.—It is announced by the United States Committee of the American Ambulance Hospital at Neuilly, France, that efforts are being made to secure endowment for individual beds at the hospital. It is estimated that for about \$600 a bed can be supported for one year, the bed bearing a commemorative plate with the names of the donors, and it is planned to have nurses in charge of these beds communicate directly with the donors regarding the work that is being done.

New England contributors will be glad to know that contributions are coming in from Chicago, St. Louis, the South and the West, but the suffering in the war zone is great, and the American Ambulance Hospital depends entirely on America for its support.

Please send contributions to Mrs. E. D. Brantdege, 82 Devonshire Street, Room 604, who will immediately forward to J. P. Morgan & Co., to be cabled to Paris. Monthly contributions are much appreciated by the committee.

AMERICAN RED CROSS IN CORFU.—Report from Athens by way of Paris on March 6, states that Dr. Edward W. Ryan and Dr. Ralph Bates, of the American Red Cross Commission to Serbia, left Athens on March 2 with 240 tons of medical and other supplies for the relief of Serbians on the Greek island of Corfu.

TREATMENT OF TUBERCULOUS FRENCH SOLDIERS.—Report from Paris on March 7 states that the Paris City Council has voted a sum equivalent to \$940,000 to erect, on the grounds of various Paris hospitals, huts for the open air treatment of 2,500 tuberculous French soldiers. It is estimated that the cost of this treatment will amount to \$600,000 yearly.

ASiATIC CHOLERA IN TREBIZOND.—The weekly report of the United States Public Health Service for March 3 stated that during the period from December 2 to 4, 1915, fifteen cases of Asiatic cholera with ten deaths were reported at Trebizond, an important Turkish port on the Black Sea.

WAR RELIEF FUNDS.—On March 11, the totals of the principal New England relief funds for the European War reached the following amounts:—

Belgian Fund	\$103,506.85
Serbian Fund	83,046.76
Allied Fund	67,381.80
French Wounded Fund	57,024.98
British Imperial Fund	48,625.38
Armenian Fund	34,873.79
French Orphanage Fund	31,208.97
Polish Fund	23,361.22
Surgical Dressings Fund	19,983.55
La Fayette Fund	19,346.53
Italian Fund	15,522.65
P. S. D. Fund	3,463.50
German Milk Fund	2,032.55

BOSTON AND NEW ENGLAND.

THE WEEK'S DEATH RATE IN BOSTON.—During the week ending March 11, there were 292 deaths reported, with a rate of 20.02 per 1,000 population as compared with 235 and a rate of 16.37 for the corresponding week of last year. There were 42 deaths under 1 year as compared with 37 last year, and 88 deaths over 60 years of age against 71 last year.

During the week the number of cases of principal reportable diseases were: Diphtheria, 63; scarlet fever, 80; measles, 136; typhoid fever, 6; tuberculosis, 54; whooping cough, 50. Included in the above were the following cases of non-residents: Diphtheria, 15; scarlet fever, 16; whooping cough, 1; measles, 1.

Total deaths from these diseases were: Diphtheria, 6; measles, 1; tuberculosis, 27; typhoid fever, 2; whooping cough, 2. Included in the

above were the following deaths of non-residents: Tuberculosis, 1.

AN EMERGENCY HOSPITAL UNIT IN BOSTON.—It is announced that, in accordance with the plans of the American Red Cross for preparedness, a movement has been initiated to organize an emergency hospital unit in Boston. A representative of the Society has recently visited this city to investigate the adaptability of the large local hospitals for this purpose. The hospitals particularly visited were the Boston City Hospital, the Massachusetts General Hospital and the Peter Bent Brigham Hospital. Investigations were also made of the facilities for transporting injured from the harbor and railroad stations to the several hospitals on short notice. The water approaches to the City Hospital were particularly studied to determine whether the wounded could be transported thither from the harbor with sufficient ease to make the hospital of value as a naval base. Dr. E. H. Nichols of Boston has been named an organizer of the Boston unit for the United States.

"According to the officials of the hospitals, more than 4,000 men could be taken care of in hospitals here should the necessity arise. The City Hospital alone can handle 1,500 bed patients in an emergency.

"The unit when completed will be composed of about 200 surgeons, physicians and nurses. Their duties will not be confined to work in the city alone in time of war, as they will be subject to government orders and may be detailed to field service or duty in any section of the country where they may be most needed. It is believed they will be officially termed as a branch of the Red Cross.

"According to reports, it is also planned to have Boston a concentration centre for supplies needed for hospital and military work in this section. No official statement regarding this report has been secured."

BABY WEEK IN BOSTON.—The practice of appointing a special day or week to emphasize and teach to the public at large the cardinal principles of hygienic living is rapidly becoming a custom. Boston in keeping so-called "baby week" has enthusiastically taken occasion to bring into prominence its campaign for not only reducing its infant death rate, but also spreading abroad information for giving to its babies a heritage of health and strength.

Various organizations, including women's clubs, the Instructive District Nursing Association, and the Milk and Baby Hygiene Association, have been instrumental in making the plan as successful as possible. Meetings have been held in various parts of the city and suburbs and the places of the meetings have included schools, department stores, churches, public libraries and club houses. Addresses have been made by physicians especially

engaged in the care of infants and by others who have special knowledge of the field of infant welfare work. There is every reason to suppose that results of such a widespread campaign, carried on with all due publicity, may maintain in this city and elsewhere a high standard of efficiency in the prevention of unnecessary infant deaths and look toward the establishment of a degree of knowledge in matters of health which must be the endeavor of every enlightened community of the present day.

REPORT OF THE BUTLER HOSPITAL.—The Butler Hospital of Providence, R. I., which treats cases of mental disease only, presents its report of the year ended December 31, 1915. The total number of patients treated during the year was 288 and the discharged numbered 145. Of the discharges, two patients were unchanged, 28 had recovered, 70 were improved, 15 were unimproved and 30 had died. Regarding its treatment of patients the report states as follows:

"In considering results of treatment it is always enlightening to review the duration of the sickness before the patient came under hospital care. Dividing all cases admitted during the year upon this basis, we find the largest group comprising patients who had been ill from two to three months. This group shows about 25% of all admissions. Twenty-three per cent. had been ill one month or less, and seven per cent., two years. The remaining 45% varied in duration from five weeks up to, in one case, sixteen years.

"If the profession and public would unite to seek early treatment in mental and nervous diseases, much better results could be obtained, both in private and hospital practice. Most of the cases received during the past year were such as should have been brought under treatment in the inception of the disease. Delay had meant always a longer duration of the illness and but too often irreparable damage. Obviously, our percentage of recoveries would be greater if cases could be admitted during the first weeks of illness instead of during the first few months, or, indeed, years. And yet, as our records show in most striking fashion, mental disease that has lasted months or years instead of weeks is by no means always incurable. We have had at least four cases of over seven years' duration that recovered entirely. One patient, sick in the hospital for nine and a half years, recovered and took up active work. A second, sick for eight years, mention of whom was made in a previous report, has been well for over two years and has resumed her work as a music teacher. Two others, ill for between seven and eight years, are now enjoying normal health and activities. With our increasing knowledge of the morbid processes affecting the nervous system, it is not too much to hope to add other cases to this rather unusual group of retarded recoveries."

Miscellany.

RESUME OF COMMUNICABLE DISEASES IN MASSACHUSETTS FOR FEBRUARY, 1916.

THERE has been a marked decrease in the number of communicable diseases reported to the health department of this state during February. During January, 1916, there were 5143 reports of cases received, while in the month just closed there were 3984. As compared with February, 1915, there was a slight increase, due to the presence of an unusual amount of measles and whooping cough. The decrease in the communicable diseases has been general over the entire state.

The preventable diseases continue their systematic slaughter. Diphtheria scored 49, whooping cough 20, scarlet fever 17, and measles 16 deaths during February, to say nothing of the 328 lives taken by tuberculosis.

Diphtheria has manifested some hopeful signs,—the fatality rate being 6.8 per hundred cases during February, while it was 8 per hundred cases during January. It is to be hoped that this is not an accident, but is due to better reporting, earlier diagnosis, and more prompt administration of antitoxin. A combination of Massachusetts parents, physicians, and public health officials can stamp out diphtheria.

Scarlet fever seems to be less virulent. The fatality for February, 1916, is 2.2%, while for the same month last year it was 4.9%.

Whooping cough and measles continue to present the most difficult problem. These diseases are accepted by the public as harmless, their prevention has been proven difficult by experience, and many health officers have given up the problem as insoluble. These two infections caused a total of 36 deaths last month. While the problem is a difficult one, it seems that we should be making some serious efforts to prevent the unhindered spread of these diseases. In many cities and towns they are practically ignored.

While there has been a general decrease in the communicable diseases in all parts of the state, in certain communities a few of the infections are unusually prevalent. In the following cities and towns there has been a decrease in the number of cases of measles: Chelsea, Lawrence, Lynn, Salem, Saugus, Winthrop and Webster, while in Newton, Lowell and Fitchburg this disease seems to be on the increase.

Diphtheria has shown a gratifying decrease in the number of reported cases. This is true in comparison with last year, as well as in comparison with the month of January. There

has been a decrease in the number of cases in the following cities and towns: Cambridge, Fitchburg. In Lowell, Haverhill, Leominster and Lynn there has been a slight increase in the number of cases.

Scarlet fever has decreased in almost all of the cities and towns where it was unusually prevalent last month. This is true in Cambridge, Worcester, Northampton and Lynn. In the last named city, while there has been a decrease, the number of cases still remains above the "normal average." Brookline, also, has an unusual number of cases.

Whooping cough is still distributed widely over the state. However, there has been a decrease in the total number of cases, both as compared with last month and with the same month last year. There has been considerable decrease in the following cities and towns: Cambridge, Mansfield and Melrose. There has been an increase in Brookline in whooping cough.

Tuberculosis continues to show the influence of the dispensaries in the increased number of cases reported each month.

Typhoid fever has shown a remarkable decrease in the number of cases reported. During February, 1915, there were 91 cases, while during the month just closed there were but 39. The epidemic reported in last month's bulletin at Fall River has been entirely controlled by the prompt action of the local board of health.

There have been no epidemics during the course of February.

During February there have been reported two cases of anthrax, one at Peabody and one at Worcester; three cases of pellagra, one in Boston and two in Danvers; and five cases of trichinosis, two in Boston, two in Worcester, and one in Newton.

Correspondence.

AN AMERICAN ASSOCIATION OF GENERAL PRACTITIONERS.

Mr. Editor: The present is a time of organization in all departments of the arts and sciences, and in social matters also. All the specialties in medicine and surgery have their organizations and the holier-than-thou surgeons have their special and exclusive one. Many of these at every opportunity appear to be interfering with and imposing upon the members of the medical profession known as general practitioners who are on the firing-line and dealing with emergencies and exacting conditions of every kind constantly. With plenty of laboratory facilities now at command, if they have not time to use their own, the family physicians who study, observe and know the constitutions, tendencies and interests of their clientele, understand them far better than any strangers can, however super-human such may assume or imagine themselves to be. Even some druggists' associations are trying in every state, for their own commercial ends, to interfere with the physicians' ancient rights and duties, and make them and their clientele subservient to the druggists' commercial interests. A surgeon cannot render his best and most efficient serv-

ice to a patient unless he has his instruments right at hand to use as needed. A physician cannot render his best and most efficient service to a patient unless he has his instruments (medicines) right at hand to use as needed, and, being so prepared, he can save many precious lives which would otherwise be surely lost by delay. The physician should have most of his remedies with him when he enters the sick-room. All the important remedies are now prepared by the best pharmaceutical houses, ready for instant use. Many of the hospitals, dispensaries, etc., that appear to be mis-managed and their resources perverted by dominating spirits, seem to be of no benefit whatever to the general practitioners in their work for the masses of the people, but rather a decided hindrance and injury by their pauperizing methods and mistaken diagnoses as shown by autopsies and subsequent histories of cases treated there. The time has come when the men in the general practice of medicine and surgery must organize as they are not organized nor ever have been before.

A national association composed of physicians and surgeons in general practice should be organized at once with branches in every state, called, if you please, The American Association of General Practitioners, or other suitable name, for the protection of their rights, duties and efficiency, and the interests of their clientele, and to have a voice in matters concerning them. There is no time to be lost. Let the physicians and surgeons in general practice throughout this country awake from their lethargic sleep and be stimulated to heroic deeds and maintain their rightful place in the sun, unless they are content to be dominated and insulted by well-paid, self-assuming, dictatorial hospital rings and others of similar nature with their advertising and soliciting methods of obtaining patients and their persistent follow-up methods of retrieving them and usurping, by any and every means, the rightful place of the family physician, while at the same time rendering less individualized and efficient service, notwithstanding their spurious and misleading claims and advertising.

EDWIN A. SANBORN, M.D.

24 Franklin St., Somerville, Mass.

DUPUYTREN AND APPENDICITIS.

Mr. Editor: In the "Leçons Orales" of Dupuytren, first published in 1832, occur the following interesting passages. The heading is "Abcès de la fosse iliaque droite." Translated, it reads:

"The inflammations and diseases of the appendix of the cecum, of which I have seen a considerable number of cases, have hardly received any attention from medical writers, and I must give credit to one of my pupils, Dr. Meller, for an excellent work on the lesions of this organ."

The following case is reported:

"Perforation of the appendix of the cecum, with a fistulous communication with the abdominal wall in the right iliac fossa." The case, after running a protracted course, finally terminated in death from an acute general peritonitis, which was started by a fresh rupture of the old walled-off abscess cavity. At autopsy, the peritoneal cavity was found to contain about three litres of reddish serum in which floated flakes of fibrin, with a few concretions; a similar exudate bound together most of the intestinal coils; the surface of the intestines was also inflamed. The part of the abdomen that had been the seat of the swelling was examined with care. The skin here was thinned and was perforated by four openings, which all communicated and led to a large opening or sort of pocket between the muscle fibres of the abdominal wall and the external surface of the peritoneum; to this pocket part of the cecum was adherent, and the appendix of the cecum was perforated here, and it could not be traced further. All this disorganized tissue seemed to be local and seemed only to rep-

resent imperfectly the original volume and shape of the tumor. It seemed a sort of cloaca, in which the appendix vanished.

In the course of his lecture, Dupuytren says:

"These abscesses present some unusual characteristics, that is, the pus finds its way into the lumen of the intestine without fecal material being always deposited in the abscess cavity. Three reasons can be given for this: the first is that these abscesses empty gradually, the intra-abdominal pressure being accountable for this, without which fecal material would be introduced. The second reason is on account of the obliquity of the perforation, and the third on account of the injury to the intestinal wall. In some cases, luckily rare, the inflammation extends rapidly from the right iliac fossa to the whole peritoneum, and in some others at the same time to the post-peritoneal cellular tissue. It is even probable that in some cases the inflammation attacks the peritoneum first, but locally, being spread only from the right iliac fossa to the rest of this membrane. Death may be the result of this extension of the malady. Such an extension of the malady should always cause us anxiety."

Those careful deductions from clinical data bring out one of many of the now forgotten achievements of this incomparable surgeon. They also give a realization of how much was known, its significance partly grasped and then forgotten, only to have the complete significance of the phenomena realized at a much later date.

Yours very truly,

WILLIAM PEARCE COUES, M.D.

Boston, March 1, 1916.

NOTICE.

THE EIGHTH AUTHORS' EVENING of ten papers on "Activities of the Speech Mechanism among the Psychoses" by Walter B. Swift, M.D., in charge Voice Clinic, and Caroline A. Osborne, M.D., Ph.D., First Assistant, at the Voice Clinic, Psychopathic Hospital, 74 Fenwood Road, Brookline, Mass., March 27, 1916, at 8 p.m.

Introduction: Historical References.

1. Speech in a Case of Tabo-Paresis.
2. The Vocal Negativism of Dementia Praecox.
3. A Speech Sign in Korsakow's Psychosis.
4. Minor Points in General Paralytic Utterances.
5. Vague Findings in Ten Dementia Praecox Cases.
6. Vocal Colorings in the Manic-Depressive Psychoses.
7. Senile Dementia and Its Vocal Signs.
8. Speech of the Juvenile General Paretic.
9. The Speech as a Key to the Psychotic Mental Content.
10. May the Speech be an Avenue for New Methods of Treating the Psychoses?

You are invited. If you expect to attend, send word to 110 Bay State Road, Boston.

SOCIETY NOTICE.

PETER BENT BRIGHAM HOSPITAL.—There will be a medical meeting in the amphitheatre of the hospital on Tuesday evening, March 21st, at 8.15 o'clock.

PROGRAM.

1. Exhibition of cases.
2. "Studies in Experimental Pneumonia." Dr. L. H. Newburgh, Dr. J. H. Means, and Professor W. T. Porter.
3. "Studies of the Renal and Coronary Circulation." Dr. A. A. Ghoreyeb.

Medical students and physicians are cordially invited. Telephone, Brookline 5260. Any visitors may be on telephone call if their names are left at the front office of the hospital.

APPOINTMENTS.

OHIO STATE UNIVERSITY. Dr. Eugene F. McCombell, secretary of the Ohio State Board of Health, has been appointed dean of the College of Medicine of the Ohio State University in place of Dr. William J. Means, who has resigned.

UNIVERSITY OF WÜRZBURG.—Dr. Waldemar Schleipp, formerly associate professor of zoology, University of Freiburg, has been called to the professorship of comparative anatomy at the University of Würzburg to succeed the late Dr. Boveri.

NORTHWESTERN UNIVERSITY. Dr. Thomas Lewis Gower has been appointed dean of the Dental School of Northwestern University.

SMITH COLLEGE. Dr. Joel E. Goldthwait of Boston has been appointed professor of hygiene and physical education.

RESIGNATION.

COLUMBIA UNIVERSITY. Dr. Gorham Bacon has resigned as professor of otology in the College of Physicians and Surgeons, New York, to take effect at the close of the present academic year.

RECENT DEATHS.

DR. JOSIAH WARREN BALL, who died recently in Boston, was born at Holden, Mass., on June 28, 1841. In 1861 he joined, as a volunteer, the Third Battalion of the Massachusetts Volunteer Militia and subsequently served throughout the Civil War in the First and Second Massachusetts Cavalry Regiments. He was promoted for gallantry to be a lieutenant and was honorably discharged from service in April, 1865. He subsequently studied dentistry at Worcester, Mass., and Marion, Ala., and on returning to Boston ultimately was graduated from the Boston Dental College in 1870. He was a member and a former president of the Massachusetts Dental Society and for several years was instructor in operative dentistry at the Boston Dental College. He is survived by his widow.

DR. LUTHER O. MARTIN, who died of cardiac disease on March 3, at Springfield, Mass., was born at Cheshire, Mass., in 1854. He received the degree of M.D. from the Medical College of Columbia University. He first practised his profession at Peterham, Mass., but in 1880 removed to Colorado. He had been a resident of Springfield since his return to the East in 1900.

DR. BENZION G. WEINICK died at his home in Roxbury, February 22, 1916, aged 48 years. He was a graduate of the Tufts College Medical School in 1908, and joined the Massachusetts Medical Society the following year.

BELGIAN PHYSICIANS' RELIEF FUND.

Report of the Treasurer of the Committee of American Physicians for the Aid of the Belgian Profession, for the week ending March 4, 1916:

No contributions for week ending March 4, 1916.	
Previously reported receipts	\$7,041.86
Previously reported disbursements	
1,625 st'd boxes food at \$2.20	\$3,575.00
1,274 st'd boxes food at \$2.30	2,980.20
353 st'd boxes food at \$2.28	804.84
Total disbursements	\$7,310.04
Balance	\$ 631.89
F. F. SIMPSON, M.D., Treasurer, 7018 Jenkins Arcade Bldg., Pittsburgh, Pa.	